ENTOMOLOGICAL
SOCIETY OF
BRITISH COLUMBIA

PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY

OF

BRITISH COLUMBIA

IN

JANUARY, 1914

NUMBER 4, N.S.

VICTORIA, B.C.:
Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
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BRITISH COLUMBIA ENTOMOLOGICAL SOCIETY.

PROCEEDINGS, 1914.

THE Thirteenth* Annual meeting of the Entomological Society of British Columbia was held in the Provincial Museum, Parliament Buildings, Victoria, on January 23rd and 24th, 1914. The following members were present: E. M. Anderson, J. R. Anderson, E. H. Blackmore, J. W. Cockle, Thos. Cunningham, G. O. Day, L. A. Breun, D. Gavet, Dr. S. Hadwen, A. W. Hanham, W. Hugh, W. H. Lyne, E. H. Robinson, L. E. Taylor, R. C. Treherne, G. E. Wilkerson, Tom Wilson, and H. H. Whiting. Among the visitors were noticed: R. V. Harvey, R. Ellis, F. Kermode, C. Blackmore, and a few others.

The meeting was called to order by the President, G. O. Day, F.E.S., of Duncan, at 10 a.m. on January 23rd. The day was divided into morning, afternoon, and evening sessions. Papers were also presented till noon of the following day, January 24th.

The President: I notice I am to present my few annual remarks at a later stage of the programme, so, reserving what I have to say till then, I will now call on our Secretary, Mr. Treherne, to present his report on the finances of the Society and the correspondence of the year.

SECRETARY-TREASURER'S REPORT.

CORRESPONDENCE.

Between forty and fifty letters have been received and answered incidental to the business of the Society during the past year. This does not include the mailing of bulletins (Nos. 2 and 3) and the issuance of the programmes of this meeting and of the Vernon meetings. Mr. W. H. Brittain officiated as Assistant Secretary during the past summer. The success and manipulation of the special summer meeting at Vernon last July were entirely due to him. Unfortunately we have lost him now, as he has gone to the College of Agriculture, Truro, Nova Scotia.

The proceedings of the January meeting at this time last year were arranged, proof-read, and duly printed. Roughly, 1,200 copies have to date been distributed of the bulletin (No. 2). These were sent to various parts of the States to the south of us, to England, to Australia, to every member of the other Provincial branches of the Ontario Entomological Society, and, of course, to our members, as well as to the members of the British Columbia Fruit-growers' Association as required them. A number of copies were left in the hands of Mr. R. M. Winslow, who distributed copies to the last members named.

The results of the special Vernon meeting were very satisfactory and pleasing to all. The proceedings were duly reviewed by me and presented to the printers. Through the kindness of the Provincial Department of Agriculture, through our amiable Minister of Agriculture, we were permitted to submit the proceedings of this Vernon meeting to the hands of the King's Printer, Victoria. The issue in due course appeared, 1,500 copies being printed, which have been distributed as before.

* The last Proceedings, No. 2, N.S., 1912, recounting the proceedings of the annual meeting on January 9th, 1913, were wrongly entitled "the Thirteenth Annual Meeting." According to information now come to our hand, we are informed that "the first meeting of this Society was called on March 13th, 1902." Considerations for the commencement of the Society were begun in 1901. This would indicate that the present Proceedings detailing the papers presented before the Society on January 23rd and 24th, 1914, were on the occasion of the Thirteenth Annual Meeting of the Society.

Our complimentary mailing-list includes the following at the present time:—

Editor, Review of Applied Entomology, London, England.
Journal of Economic Entomology, Concord, New Hampshire.
Smithsonian Institute, Washington, D.C.
Library, U.S. Department of Agriculture, Washington, D.C.
Library, Division of Entomology, Ottawa, Canada.
L. J. Newman, Entomologist, Perth, Western Australia.
P. J. Parrott, New York Agricultural Exposition Station, Geneva, N.Y.
H. F. Wilson, Entomologist, Corvallis, Oregon.
A. L. Lovett, Assistant Entomologist, Corvallis, Oregon.
Dr. Edwin C. Van Dyke, Berkeley University, California.
Prof. J. C. Bridwell, Berkeley University, California.
The Monthly Bulletin, Sacramento, California.
The Fruit and Farm Magazine, Vancouver, B.C.
Harry A. Smith, Parasite Laboratory, Sacramento, California.
Le Roy Childs, Horticultural Department, Sacramento, California.
W. H. Brittain, Agricultural College, Truro, Nova Scotia.

Letters of congratulation on our recent publications have been received from—

S. J. Neville, Cottonwood, Saskatchewan.
Theo. D. A. Cockerell, Boulder, Colorado.
John Dearness, London, Ontario.
Prof. H. F. Wilson, Corvallis, Oregon.
Dr. C. Gordon Hewitt, Dominion Entomologist.

The correspondence of the Society is retained in a special book kept for the purpose and is open to all members for perusal at any time.

Mr. Arthur Gibson, Chief Assistant Entomologist, Ottawa, has written asking our members to assist him in the collection of all moths and butterflies, in particular the Arctiids.

Prof. H. F. Wilson wishes to obtain all specimens of Aphididae that he can from the Pacific North-west, and has asked me to place his request before the members of this Society.

Mr. J. D. Tothill, of the Division of Entomology, Ottawa, is particularly interested in parasitic Hymenoptera and would be pleased to receive any specimens from the West. He wishes, in particular, to obtain the parasites of the tent-caterpillars.

Mr. J. M. Swaine, of the Division of Entomology, Ottawa, again requests specimens of forest insects, and Mr. F. W. L. Sladen, of the same Division, renews his wishes for Aculeate Hymenoptera, bees and wasps.

Respectfully submitted,
R. C. TREHERNE.

FINANCIAL STATEMENT.

YEAR ENDING DECEMBER 31ST, 1913.

Deficit carried forward	$ 56 00	
Printing Report No. 2, N.S.	307 00	
Printing programmes, 1913 summer meeting	8 00	
Printing programmes, 1914 winter meeting	11 50	
Postage, 1913	12 00	
Provincial Government grant	..	$250 00
By sale of copies of Report No. 2	..	3 00
Membership subscriptions received for the year 1914-15 to date, January 23rd	..	45 00
	$394 50	$298 00
Deficit	$96 50	

The President: It is unsatisfactory to feel that we have a deficit on our hands, but under the circumstances, and in view of the great strides our Society has made during the past two years, we cannot complain. It gives me a great deal of gratification to feel that this Society is attracting such widespread attention in other lands than our own. It is nice to think that we are making some headway and adding, possibly, a few iotas of knowledge to the entomological world.

The next item of business that confronts us is the important discussion relative to the adoption of by-laws. As has been pointed out in our proceedings from time to time, this Society is a properly constituted branch of the Canadian Society of the East, consequently as such we are bound to accept the constitution of our parent Society. I take pleasure in reading you and recording for our proceedings the constitution of our parent Society. You will remember that at this meeting of last year a resolution was passed asking the Advisory Board to draw up a system of by-laws to present to the special summer meeting that was arranged at Vernon in the month of July, 1913. The members present at this meeting were then asked to amend, if necessary, and present their opinions to this meeting for adoption. However, owing to the fact that the Constitution of the parent Society was undergoing a change in certain particulars, it was thought inadvisable to draw up our own by-laws until these changes were made known and properly ratified. The parent Society held their meeting last August at Guelph, and the following Constitution, which appeared in a recent issue of the *Canadian Entomologist*, is the amended and adopted code. It is well that we fully digest this Constitution, as it is also the one that governs our Society. We are at liberty, however, to frame our own by-laws, and these our Secretary has arranged for discussion on the back of the programmes before the meeting, so, after the Constitution of the parent Society has been read, we will proceed with our own by-laws.

CONSTITUTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

INCORPORATED 1871.

SECTION I.—OBJECTS AND MEMBERSHIP.

1. The Society shall be called "The Entomological Society of Ontario," and is instituted for the investigation of the character and habits of insects, the improvement and advancement of entomological science, and more especially its practical bearing on the agricultural and horticultural interests of the Province. The Society shall consist of not less than twenty-five members.

2. The Society shall consist of four classes, viz: Members, life members, honorary members, and corresponding members.

3. Members shall be persons whose pursuits, or studies, are connected with entomology, or who are in any way interested in natural history, and who are resident within the Dominion of Canada.

4. Life members shall be persons who have made donations to the value of $25 in money, books, or specimens (the two latter to be valued by competent persons), or who may be elected as such at the general meeting of the Society, for important services performed, and after due notice has been given.

5. Entomologists residing outside Canada may be elected corresponding members of the Society, but such membership will not entitle them to the publications of the Society except on payment of the subscription to the Journal of the Society.

6. Honorary members shall be members of high standing and eminence for their attainments in entomology.

7. The number of honorary members shall be limited to twenty-five.

8. The officers of the Society shall consist of a President, a Vice-President, a Secretary-Treasurer, and not fewer than three, and not more than five, Directors, to form a Council; all of whom, with two Auditors, shall be elected annually at the annual general meeting of the Society, and shall be eligible for re-election. The said Council shall, at their meeting, appoint a Curator.

SECTION II.—ELECTION OF MEMBERS.

1. All candidates for ordinary or life membership must be proposed by a member at a regular meeting of the Society and be balloted for; the affirmative vote of three-fourths of the members present shall be necessary for the election of a candidate.

2. Honorary members must be recommended by at least three members, who shall certify that the person named is eminent for his entomological attainments; the election in their case shall be conducted in the same manner as laid down for other members.

3. Corresponding members shall be elected in the same manner as honorary members.

4. Whenever any person is elected a member in any class, the Secretary shall immediately inform him of the same by letter, and no person shall be considered a member until he has signified his acquiescence in the election.

5. Every person elected a member is required to pay his first contribution within one month of the date of his election; otherwise his election shall be null and void.

SECTION III.—CONTRIBUTIONS.

1. The annual contribution of members shall be $1; all contributions to be due in advance on the first day of January in each year, the payment of which shall entitle the member to a copy of all the publications of the Society during the year. All new members, except those elected at and after the annual general meeting and before the following first of January, shall be required to pay the subscription for the year in which they are elected.

2. Every member shall be considered to belong to the Society, and as such be liable to the payment of his annual contribution, until he has either forfeited his claim or has signified to the Secretary, in writing, his desire to withdraw, when his name shall be erased from the list of members.

3. Whenever any member shall be one year in arrear in the payment of his annual contribution, the Secretary shall inform him of the fact in writing. Any member continuing two years in arrears shall be considered to have withdrawn from the Society, and his name shall be erased from the list of members.

4. Life and honorary members shall be required to pay an annual contribution.

SECTION IV.—OFFICERS.

1. The duties of the President shall be to preside at all the meetings of the Society, to preserve good order and decorum, and to regulate debates.

2. The duties of the Vice-President shall be the same as those of the President during his absence.

3. The duties of the Secretary-Treasurer shall be to take and preserve correct minutes of the proceedings of the Society, and to present and read all communications addressed to the Society; to notify members of their election, and those in arrear of the amount of their indebtedness; to keep a correct list of the members of the Society, with the dates of their election, resignation, or death, and their addresses; to maintain the correspondence of the Society, and to acknowledge all donations to it. He shall also take charge of the funds of the Society and keep an accurate account of all the receipts and disbursements, and of the indebtedness of the members, and render an annual report of the same at the annual general meeting of the Society, in the manner required by the Act respecting the Board of Agriculture and Arts.

4. It shall be the duty of the Curator to take charge of all books, specimens, cabinets, and other properties of the Society; to keep and arrange in their proper places all donations of specimens; to keep a record of all contributions of books and specimens, with a list of the contributors; and to oversee and direct any exchange of specimens. He shall also report annually to the Society on the condition of the specimens and cabinets under his care.

5. The officers of the Society shall form a Council who shall have the direction and management of the affairs of the Society. The Council shall meet once in every quarter, the time and place of meeting to be appointed by the President, and notice to be given by the Secretary at least ten days beforehand.

6. The Council shall draw up a yearly report on the state of the Society, in which shall be given an abstract of all the proceedings, and a duly audited account of the receipts and expenditure of the Society during their term of office; and such report shall be read at the annual general meeting.

SECTION V.—MEETINGS.

1. Ordinary meetings shall be held once a month, on such days and at such hour as the Society by resolution may from time to time agree upon.

2. The annual general meeting of the Society shall be held at the place and during the same time as the Exhibition of the Agricultural and Arts Association is being held in each year, to receive and deliberate upon the report of the Council on the state of the Society, to elect officers and Directors for the ensuing year, and to transact any other business of which notice has been given.

3. Special meetings of the Society may be called by the President upon the written request of five members of the Society, provided that one week's notice of the meeting be given, and that its object be specified.

SECTION VI.—BRANCHES OF THE SOCIETY.

1. Branches of the Society may be formed in any place within the Dominion of Canada on a written application to the Society from at least six persons resident in the locality.

2. Each branch shall be required to pay to the parent Society 50 cents per annum for each paying member on its list.

3. Every branch shall be governed by the Constitution of the Society, but shall have power to elect its own officers and enact by-laws for itself, provided they be not contrary to the tenor and spirit of the Constitution of the whole Society.

4. All members of the branches shall be members of the Society and entitled to all the privileges of members.

5. No corresponding or honorary member shall be appointed by the branches, but such members may be proposed at general meetings of the Society by any branch as well as by the individual members.

6. Each branch shall transmit to the parent Society, on or before the first of September each year, an annual report of its proceedings; such report to be read at the annual general meeting.

SECTION VII.—ALTERATION OF CONSTITUTION.

1. No article in any section of this Constitution shall be altered or added to, unless notice be first given at an ordinary meeting of the Society, or of a branch, and the alteration or addition be sanctioned by two-thirds of the members present at the next ensuing meeting; the Secretary of the Society, or of the Branch, shall then notify the Secretaries of all the other branches; when the sanction of all the branches has been obtained in the same manner, the alteration or addition shall become law.

SECTION VIII.—SUBSCRIPTION PRICE OF MAGAZINE.

The annual subscription price of the *Canadian Entomologist* shall be $2, postage included, payable in advance. Members of the Society who have paid their annual dues shall receive the magazine free of charge, as stated in section III., clause 1, of the Constitution of the Society.

The by-laws of the Society were approved and voted upon, article by article, and are herewith recorded as passed by the Society in annual convention, January 23rd, 1914.

BY-LAWS OF THE ENTOMOLOGICAL SOCIETY OF BRITISH COLUMBIA.

TITLE.

Article 1.—This Society shall be known as the "Entomological Society of British Columbia," being the British Columbia Branch affiliated with the Entomological Society of Ontario (hereinafter called "the parent Society").

RELATIONSHIP.

Article 2.—This Society shall remain an integral unit in the entomological work of the Dominion of Canada, shall remain embodied in aims and endeavours with other branches of the parent Society, and shall continue in connection with and under the constitution of the parent Society.

OBJECTS.

Article 3.—The objects of this Society shall be—

(1.) To endeavour to co-ordinate and unite the work, notes, and observations of all those engaged in the study of insects, and to encourage those interested in the same study throughout and within the confines of this Province of British Columbia:

(2.) To collect and study the insects of the Province of British Columbia and to render aid and assistance to the best of its ability, either through the members individually or through the Society in convention, to all students in the science of entomology in the Province:

(3.) To obtain, by exchange with the parent Society and branches of the same, specimens of insects from all parts of the Province of British Columbia, the same to be the property of the branch, and to form a complete collection of the insects of the Province for the use and benefit of the members of the Society under the charge of a duly appointed Curator:

(4.) To identify for and render aid and assistance, or cause the same to be done, to fruit-growers, farmers, gardeners, and private individuals, either through the knowledge or advice of individual members in their respective localities or through the medium of the Society, its members and its publications, on all subjects relating to insect-life, economically affecting the household, farm crops, fruit, or live stock, or any other pertaining branch of Agriculture.

SUBSCRIPTION.

Article 4.—The annual subscription shall be $1 (50 cents of which shall be sent to the parent Society to receive the publications of that Society), on payment of which, and on approval of three-fourths of the members present at the regular annual meeting, the individual becomes a duly accredited member. To obviate the necessity of paying the dues annually and in season, members shall be permitted to pay $5 for five successive years.

PAPERS.

Article 5.—Papers bearing on entomological subjects only may be presented at any of the meetings of the Society, and the members are permitted to use and publish their own papers in any manner they choose, the Executive also reserving the right to use and publish them as they deem fit.

ANNUAL MEETING.

Article 6.—The regular annual meeting of the Society shall take place during the month of January in each year.

ORDINARY MEETINGS.

Article 7.—Ordinary meetings may be held at any time or at any place without the consent of the Executive by not less than five members, the results of such meetings being duly presented to the Executive at the time of the annual meeting.

SPECIAL MEETINGS.

Article 8.—Special meetings of the Society may be held at any time or at any place, the time and the place being approved of and decided upon by the members present at the time of the regular annual meeting. At neither any ordinary or special meeting may business of the Society be transacted relative to the altering of any of these by-laws or opposing the general tenor of the same.

BRANCHES.

Article 9.—Branches of the Society may be formed in any place within the Province of British Columbia on written application to the Executive from at least six persons resident in the locality.

Article 10.—Each branch shall be required to pay to the parent branch $1 per annum for each paying member on its list, and shall be governed by the constitution of the parent Societies, but shall have power to elect its own officers and form its own by-laws.

OFFICERS.

Article 11.—The officers of the Society shall consist of a President, two Vice-Presidents, a Secretary-Treasurer, an Assistant Secretary, and with these not fewer than three and not more than five members to act as an Advisory Board.

ALTERATIONS.

Article 12.—These by-laws may be altered or amended only at the regular annual meeting of the Society by the approving vote of three-fourths of the members. Such alterations must be made by notice of motion, which shall have been sent to the Secretary, and a copy of such be in the hands of the members at least one month previous to the annual meeting. Written votes by members upon subjects about which one month's notice has been given may be accepted by the Society at the annual meeting in lieu of presence.

The President: The next item on the programme will be the presentation of reports from the various districts.

REPORT FROM THE VICTORIA DISTRICT: INSECT NOTES OF THE YEAR.

BY E. H. BLACKMORE, VICTORIA.

I notice that the yearly reports from the different districts generally relate to the year's economic conditions, but, as I am a systematic and not an economic entomologist, my report will have to be along the lines of the systematic collector, and as there are some of these gentlemen present this morning, I hope it will not be without some interest. I would like to mention here that during the past season my occupation has taken up the whole of my evenings, leaving me the days free, so that most of my observations and captures have been amongst the Diurnals and day-flying moths.

There were fewer insects on the wing than usual this season, some of our commonest butterflies being very scarce, especially the first broods of *P. rapæ* (the common white), *C. ampelos* (the ringless ringlet), and *E. helloides* (the purplish copper). *Papilio rutulus* (the common tiger-swallowtail) and *P. eurymedon* were fairly common at Goldstream in mid-June, although *P. zolicaon* was very scarce. This is never a common species by any means; in fact, I only observed two specimens the whole season. *Argynnis bremnerii* (Bremner's silver-spotted fritillary) and *A. rhodope* were not so plentiful as in former years, but, on the other hand, *Brenthis epithore* was fairly common. *Eurymus occidentalis* (the yellow sulphur) was to be obtained in early June, but mostly only males, the females being very scarce, which may account for the species not being very plentiful at any time. Its orange congener (*E. eurytheme*) was again absent, and I have not seen a specimen for two

years. There is another butterfly which seems to have disappeared, and that is the pine white (*Neophasia menapia*). I made a special trip after it at Goldstream the first week in September, but did not see a single specimen. I captured three in September, 1911, but have not seen one since. *Eugonia californica* (the California tortoiseshell) was scarce, and I did not see a red admiral (*Vanessa atalanta*) during the whole season, although I kept a sharp look-out for it, as I have only taken two specimens during the last three years. *Vanessa cardui* (the painted-lady) and *V. caryæ* I have not seen at all during the same length of time, although *cardui* is supposed to be fairly common.

There is still another butterfly which I have been trying hard to get, and that is *Œneis nevadensis*, Feld (better known as *gigas*, Butler). It generally appears about June 10th, but owing to the wet weather which occurred at that time, I did not see a single specimen.

Coming to the family of the Lycænidæ (the hairstreaks, blues, and coppers), I found *Uranotes melinus* (the common hairstreak) and *Thecla californica* much scarcer than usual, the first brood of the first named being exceedingly so. On April 18th I took eight *Incisalia mossi*, six males and two females. The next three days it rained, and I went again on the fourth day, but did not see any flying about. As I wanted to get a few more, I made a careful search of the bracken over which they play, and found one male, but after that date I did not see it again.

Behr's eyed blue and *Cyaniris ladon var. nigrescens* were the first blues out, appearing towards the end of April, and they were fairly plentiful, but *Everes amyntula* (the Western tailed blue), which came out two weeks later, was very much scarcer, and *Cupido sæpiolus*, which did not put in an appearance until June 2nd, this year was scarcer still. The weather, which was very wet about this time, seemed to kill them off in a few days. The skippers apparently were made of sterner stuff, and they seemed to stand the vicissitudes of the weather better, as *Thanaos propertius* was very common in the spring and *Thorybes pylades* (the Northern dusky-wing) was more plentiful than it usually is, but unfortunately after the first few days they were entirely unfit for the cabinet. I am glad to be able to record the capture of one each of *Thecla blenina* (Hewitson's hairstreak) and *Erynnis comma var. nevada*, which two species are rather rare in this district, especially the first named.

Turning to the Nocturnals, I found *Smerinthus opthalmicus* fairly plentiful from May 13th to 26th, hanging to the cables between the arc lights and the electric-light poles. On the first morning that I went around, in company with the lamp-trimmer, I obtained nine specimens of *S. opthalmicus* on one cable; on another I found five, four males and one female, evidently a case of double attraction, that of light and that of sex. In the same way I captured *Sphinx vancouverensis*, *Deilephila gallii*, *Samia columbia*, and several other good things, only in much smaller numbers. *Diacrisia virginica* (the Virginian tiger-moth) was extremely abundant from the end of April until the end of June, and I took one in perfectly fresh condition as late as August 8th.

As I was unable to do any sugaring, I do not know what results were obtained along that line of attraction, but "sallowing" was very late this season. Owing to the cold wet spring the sallows were very late in blooming, and when they did bloom the weather continued so bad that a start could not be made until the bloom was nearly over. At the kind invitation of an entomological friend, I went to Quamichan Lake in April for a couple of nights "sallowing." During the afternoon it had rained very heavily and the evening was a little chilly, so that our expectations were not very great. However, the "catch" turned out much better than was expected, and from six trees visited that night we gathered eighty-six specimens, representing twenty different species, amongst which were *Graphiphora ferrigera*, *Xylina ferrealis*, *X. torrida*, *X. holocinerea*, *Calocampa nupera*, and *Euharveya carbonaria var. dives*.

The Geometridæ with a few exceptions were rather scarce during the past season; out of a total of seventy-two different species taken from March to November, there were no less than forty-four species of which I only obtained from one to three specimens of each kind. The exceptions were the genus *Hydriomena* and its allies, the Petrophoras and the Cleora group. I am pleased to record the taking of two specimens of that rather rare Geometer *Zenophelps victoria*, which was described by the late Rev. G. W. Taylor from two specimens taken in this city. I took them both in August, one on the 14th and the other on the 20th.

I collected quite a number of Coleoptera during the season, which included several very interesting forms that as yet I have not had time to determine. I was fortunate in capturing three specimens of that very rare beetle *Zacotus matthewsii* in the garden attached to my house. I obtained two in July and one in August. I was on the look-out for tiger-beetles in the spring and early summer, but did not see any until the first week in September, when I took several specimens of *Cicindela oregona* at Goldstream. Appended is a list of the rarer moths captured during 1913 and not included in the foregoing remarks. The numbers in front of each species correspond to those in Dyar's List.

YEAR 1913.

788.	Scepsia packardii	July 22nd.
848.	Leptarctia californicæ	April 27th.
848B.	Leptarctia californicæ var. dimidata	April 29th.
864.	Diacrisia rubra	May 1st.
873.	Platyprepia virginalis	July 8th.
952.	Alypia langtonii	June 3rd.
1219.	Hadena suffusca	June 14th.
1487.	Noctua rosaria	May 26th.
1494.	Noctua inopinatus	July 30th.
1496.	Noctua clandestina	Sept. 17th.
1851.	Mamestra pensilis	July 30th.
1901.	Xylina cognata	March 28th.
1951.	Nephelodes pectinatus	Aug. 14th.
2222A.	Orthosia ferruginoides	Sept. 20th.
2482.	Autographa mappa	July 16th.
2514.	Autographa celsa	Sept. 7th.
2524.	Autographa corrusca	July 30th.
3081A.	Hypena decorata	Oct. 2nd.
3151.	Schizura unicornis	June 11th.
3253.	Philopsia nivigerata	May 4th.
3294.	Eupethecia coagulata	May 9th.
	Eupethecia columbiata	July 16th.
3337.	Epirrata dilutata	Oct. 20th.
3353.	Perstroma nubilata	June 19th.
3357.	Neolexia xylina	Aug. 27th.
	Mesoleuca occidentata, Taylor	July 23rd.
	Mesoleuca occidentata var. mutata, Taylor	July 20th.
	Mesoleuca decorata, Taylor	July 20th.
3456A.	Petrophora munitata var. labradorensis, Pack.	June 11th.
3550.	Eois sideraria	June 18th.
3656.	Sciagrapha neptaria	May 7th.
3776.	Enypia venata	July 24th.
	Enypia packardata, Taylor	July 31st.
3902.	Sicya macularia	Aug. 20th.
3976.	Synaxis pallulata	Sept. 6th.
3784.	Alcis sulphuraria	July 13th.

4037. Brephos infans ..... April 15th.
4043. Callizzia amorata ..... Aug. 8th.

The following Geometers are new to the British Columbia List:—

Eupethecia mutata, Pearsall ..... July 18th.
Dysstroma citrata var. suspectata ..... Aug. 12th.
Dysstroma citrata var. punctum notata ..... Aug. 20th.
Hydriomena autumnalis var. crockeri, Swett ..... May 4th.
Hydriomena speciosata var. taylori, Swett ..... July 3rd.
Hydriomena edenata, Swett ..... April 5th.
Hydriomena irata, Swett ..... May 7th.
Petrophora defensaria var. amorata ..... Sept. 24th.

REPORT FROM THE OKANAGAN DISTRICT: INSECT PESTS OF THE YEAR IN THE OKANAGAN.

BY W. H. BRITTAIN, PROVINCIAL ENTOMOLOGIST FOR NOVA SCOTIA (FORMERLY OF BRITISH COLUMBIA).

The summer of 1913 was not marked by any insect outbreaks of unusual severity. Most of the usual pests were present in greater or less numbers, while several interesting records were made for the first time. The following are some of the most important pests to receive attention during the year:—

BUD-WORM (*Tmetocera ocellana*).

This insect was found working in several orchards in the Kelowna District, though not in sufficient numbers to do a great deal of damage. Three distinct species of moths were reared from larvæ resembling those of the true bud-moth (*Tmetocera ocellana*). This is interesting in view of the fact that the twig-boring habits of the bud-moth, which have been repeatedly observed in British Columbia, do not appear to have been noted elsewhere. It is possible that one of these other species is responsible for this work.

THE ANTIQUE TUSSOCK-MOTH (*Orgyia antiqua*).

The larvæ of this insect were unusually numerous in the orchards this season, but it is of only minor importance as a fruit pest.

CLIMBING CUTWORMS (Noctuidæ).

These insects, of which we had nearly a plague last year, could hardly be found at all this season. As we had no facilities for rearing these insects last season and they occurred in such small numbers in the spring of the present year, we do not know of what particular species they belonged.

TENT-CATERPILLARS (*Malacosoma spp.*).

These insects appeared in large numbers in the spring, but were practically wiped out before reaching maturity by their parasites and by a bacterial disease with which they were attacked. From the large number of larvæ we collected for rearing no adult moths emerged.

CODLING-MOTH (*Cydia pomonella*).

There was no further outbreak of this insect in the Armstrong District this year, the measures taken for its eradication having apparently proved successful. An outbreak occurred at Kelowna, however, though not in the same orchards as last year.

LESSER APPLE-WORM (*Enarmonia prunivora*).

This insect was unusually abundant throughout the orchards of the Okanagan this season, and many specimens reached the office from the different districts. From the letters that we have received, it would seem that this insect is on the increase. From its general resemblance in habits, life-history, and appearance to the codling-moth, it is frequently mistaken for this more serious pest.

In going over a large number of apples attacked by this insect we found that about 60 per cent. entered by the side of the apple. Here the greater number made shallow borings just below the skin, the larva, in most cases, being visible from the outside. Some few bored right to the core and fed around it, somewhat after the manner of the codling-moth; others, again, bored aimlessly throughout the pulp in all directions. About 25 per cent. entered by way of the stem end of the apple and the remainder through the calyx end.

THE FALL WEB-WORM (*Hyphantria cunea*).

The ugly webs of this insect were very much in evidence throughout the country this summer. They were commonest on the apple and the wild cherry-trees.

RED-HUMPED APPLE-TREE CATERPILLAR (*Œdemasia concinna*).

Very abundant and doing considerable damage locally to the foliage of apple-trees.

YELLOW-NECKED APPLE-TREE CATERPILLAR (*Datana ministra*).

These insects were present in unusually large numbers. In some of the young orchards they were responsible for the almost entire defoliation of a large number of trees.

PEACH-TREE BORER (*Sanninoidea exitiosa*).

This insect is a serious enemy of the peach in the southern Okanagan. A male and a female moth were reared this season from pupæ collected and sent me by Mr. W. H. Lyne. The male emerged on July 30th and the female on August 4th.

That we have the Eastern species in British Columbia is interesting, as elsewhere in the North-west a related species, *Sanninoidea opalescens*, is the common form.

THE IMPORTED CURRANT-BORER (*Ægeria tipulformis*).

This insect was present and doing noticeable damage in a few places.

PLUM AND APPLE SPHINX (*Sphinx drupiferarum*).

This large caterpillar will often strip all the leaves from a young tree in a very short time. They are very subject to the attacks of parasites, and for this reason never become numerous enough to do widespread damage.

CICADA (*Platypedia putnami?*).

These insects appeared in large numbers this year and were responsible for a certain amount of damage to the apple-trees by ovipositing in the twigs.

CHERRY-TREE TORTRIX (*Archips cerasivorana*).

A very common insect on the choke-cherries, but also found occasionally feeding on the leaves of apple-trees.

FRUIT-TREE LEAF-ROLLER (*Archips argyrospila*).

This insect was present in fairly large numbers throughout the Okanagan during the past summer. They feed upon the foliage of the apple, first bending over the leaves and tying them together with silk. They also feed upon the blossoms, but their worst injury is done to the young fruit. This they tie up as they do the foliage and eat small cavities in the sides. Considerable loss was occasioned in some places by this work.

OYSTER-SHELL SCALE (*Lepidosophes ulmi*).

This insect is rarely injurious in young or in well-cared-for orchards in the Okanagan. In old neglected orchards, however, it is frequently the cause of considerable loss. Not only is it of importance as attacking the twigs and limbs, but not uncommonly the young scales find their way to the fruit and there form their scale. Some bad cases of this were noticed this season.

EUROPEAN SCALE (*Aspidiotus ostreæformis*).

Specimens of this insect were received from Penticton and from Kelowna. Up to the present time it has not occurred in injurious numbers.

APPLE-LEAF HOPPER (*Empoasca mali*).

The egg-blisters of this insect were abundant everywhere this spring in the new growth of the apple. Most commonly they were found in one-year-old wood, occassionally in two-year-old wood, and rarely in three-year-old. One or two eggs are found in each egg-blister. In examining a large number of these eggs this spring it was found that about 20 per cent. were parasitized by a small hymenopteran, which could readily be observed fully formed within the egg. The young hoppers began to emerge in the laboratory on May 9th, and a week later were practically all out.

Two distinct broods of this insect occur in the Okanagan. Leaves attacked by the leaf-hoppers rarely become curled in this district, as has been described elsewhere, but such leaves are mottled over with whitish or yellowish spots. On the fruit the injury shows as small, white circular marks about ⅛ inch diameter.

TARNISHED PLANT-BUG (*Lygus pratensis*).

This insect was noted attacking a wide range of crops, but probably the most damage was done to nursery stock. Leaves that are attacked when young become wrinkled and curled. Sometimes small areas of the leaves become brown and die, subsequently dropping out and producing a "shot-hole" effect. Blossom-buds attacked are retarded in development, if not killed. Leaf-buds, when pierced at the base, frequently die and drop off.

GREEN APPLE-APHIS (*Aphis pomi*).

This insect, which is the most widespread and destructive of our apple-insects, was considerably less numerous than last year in most sections. In fact, the loss resulting from its attacks in the Okanagan was this year very slight.

ROSY APHIS (*Aphis sorbi*).

This insect was found for the first time this season in the Okanagan. Specimens were taken both at Vernon and Kelowna. It has not gained a very firm foothold in either district as yet, but may be expected to cause trouble in the future.

THE WOOLLY APPLE-APHIS (*Eriosoma lanigera; americana?*).

This insect seems to be upon the increase and to be growing in importance as a fruit pest. Very few young orchards are badly infested, but a number of the older, more or less neglected ones have suffered severely. The root form of this insect is sometimes found in the Okanagan.

ELM-LEAF LOUSE (*Eriosoma americana*).

The elm-leaves in the City of Vernon this summer were badly attacked by this insect. In some cases it caused partial defoliation of the trees.

THE CURRANT-APHIS (*Myzus ribis*).

This insect was very common on the currants everywhere.

THE BLACK CHERRY-APHIS (*Myzus cerasi*).

This aphis was fairly abundant in most sections. It is the most important insect of the cherry.

MEALY PLUM-APHIS (*Mylopterus arundinis*).

A common insect pest of the plum.

CABBAGE-APHIS (*Aphis brassicæ*).

Common and injurious to cabbages and turnips.

FRUIT-LEAF BEETLE (*Syneta albida*).

A number of specimens of this beetle were sent in from Rand, B.C., where they were reported to be doing damage to strawberries and clover. In Oregon this insect is reported to cause serious damage to the foliage of fruit-trees, and no satisfactory control measures have so far been found.

FLEA-BEETLES (*Epitrix subcrinita*).

These insects appeared in large numbers this year, and in some sections did a great deal of injury to tomato plantations. Potato-fields were in like manner attacked and damaged by the insects, which also fed freely upon the lamb's-quarters and other weeds about the fields.

BRONZE APPLE-BORER (*Magdalis ænescens*).

This insect is very commonly found boring into the injured wood of apple-trees. Though I have not seen this insect enter an absolutely sound tree, it may sometimes be found boring from diseased wood into the healthy tissue.

CLICK-BEETLES (Elateridæ).

Though practically nothing has been written on the leaf-eating habits of these insects, they every year do considerable damage in the Okanagan by feeding upon the buds and tender foliage of apple-trees. Like the climbing cutworms, these insects prefer young trees, one-, two-, and three-year-old trees being injured worst. As no satisfactory remedy is at present in vogue, a knowledge of the life-history and early habits of these insects is very desirable.

The most common and injurious species is *Corymbites inflatus*. This spring I found a very severe infestation at Short's Point of *Cardiophorus fenestratus*.

Other species taken from orchards in the Okanagan are: *Corymbites morulus*, *C. fallax*, *C. maurus*, *C. furtivus*, *C. conjungens*, *C. aeripennis*, *C. cruciata*, *C. triundulatus*, *Cardiophorus tenebrosus*, *Elater nigrinus*, *Dolopius lateralis*, *Limoniun pilosus* (*infuscatus*), *L. discoideus*, *L. venablesi*, *L. canus*, *Cardiophorus tumidicollis*.

GREY LEAF-BEETLE (*Glyptoscelis pubescens?*).

This insect is present in abundance in the spring, feeding mainly upon *Balsamorrhiza sagittata*, but it occasionally attacks apple-foliage.

CURRANT FRUIT-FLY (*Epochra canadensis*).

Considerable damage was done to the currants this season by this pest.

RASPBERRY-CANE MAGGOT (*Phorbia rubivora*).

Though I have never taken this insect in the Okanagan, numbers of specimens have been sent in from other sections of the Province.

ONION-MAGGOT (*Pegomyia ceparum*).

Fairly common in gardens about Vernon.

THE HYACINTH-MITE (*Rhizoglyphus hyacinthi*).

This spring my attention was called to an onion plantation at Vernon where a large proportion of the young onions were withering and dying away. On examining the roots and young bulbs, they were found to be covered by these mites, which in many cases had burrowed right into the root. If these mites ever become widely injurious, control will be rendered difficult by the fact that they have no respiratory system.

THE RED SPIDER (*Tetranychus bimaculatus*) AND THE BROWN MITE (*Bryobia pratensis*).

Both these mites were common in the Okanagan this year, but the former was present in much larger numbers and responsible for more damage.

PEAR-LEAF BLISTER-MITE (*Eriophyes pyri*).

In a few isolated cases found this mite severely injuring pears. Have never found it attacking apple-trees in British Columbia.

THE "RUSTY-LEAF" MITE (*Phyllocoptes schlectendali*, Nalepa).

This species is widely distributed all over the northern United States and probably Canada. It has been recorded from Oregon by Prof. P. J. O'Gara.

This mite feeds upon the upper surface of the apple-leaves. The symptoms exhibited by foliage so attacked varies greatly. In some cases the leaves present a red, rusty appearance which gives the mite its popular name. More often, however, at least in the Vernon District, the leaves have a decided silvery appearance. On this account, the work of this pest is almost invariably confused with the disease called "silver-leaf."

The two troubles differ from each other, however, in several important particulars. In the case of the silver-leaf the entire leaf is uniformly silvered, while in that of the mite-work it is usually more or less patchy. When a leaf attacked by the mite is examined with a lens, small islands of normal green tissue can be detected among the rest. The leaves of trees attacked by the true silver-leaf are characterized by a soft milky gloss, while those attacked by the mites have usually a decided metallic lustre.

The prevalence of these two troubles, so similar in appearance, has caused a great deal of confusion in the minds of fruit-growers and others, and something should be done to distribute in the fruit sections accurate information of how to distinguish between them.

Several other species of mites produce a silvery appearance upon the leaves of the trees which they attack. A very bad attack of the common red spider (*Tetranychus bimaculatus*) frequently produces this effect on plum-leaves. Elm-leaves attacked by mites also frequently exhibit a decided silvery sheen.

THE "APPLE-SCAB" MITE (*Eriophyes malifoliæ?*).

The work of this mite is very abundant in the Vernon District on apple-foliage, and is almost invariably mistaken for apple-scab. The presence of the mites was first pointed out to me by Mr. H. T. Güssow, Dominion Botanist, and the species was determined by Dr. Nathan Banks as probably *Eriophyes malifoliæ*.

The work of mites is characterized by brownish or black areas upon the leaf, convex on the upper side, concave on the lower. The mites themselves are found on the under-side, concealed by the pubescence of the leaf. When the mites are present in large numbers the entire leaf may be withered and brown.

THE GARDEN MILLIPEDE (*Julus hortensis*).

Though injury from millipedes is not common, reports of damage done, particularly to vegetables in gardens, are received from time to time. The remedy is to soak slices of turnip, carrot, etc., in lead-arsenate solution, 2 lb. of the paste form in a gallon of water, and to distribute this poisoned bait around the infested portion of the field.

I append a list of captures for the Okanagan, mainly Coleoptera:—

COLEOPTERA.

Arodus crenatus, Lay. .....B.C.
Eleodes pimelioides, Mann.
Epicauta maculata, Fab. .....Swan Lake, B.C.
Eleodes obscura, Mann. .....Larkin, B.C.
Corymbites inflatus .....Penticton, B.C.
Trogositus virescens, Fal. (eating-apple) .....Larkin, B.C.
Corymbites hieroglyphicus, Lay. .....B.C.
Alares melanops, Lec. .....Larkin, B.C.

Blyphylla decemlineate, Lay. .....Swan Lake, B.C.
Prionus californicus .....Swan Lake, B.C.
Pachyta spurea, Lec. (July, 1912) .....Swan Lake, B.C.
Acanthocinus obliquus, Lec. .....Swan Lake, B.C.
Clytus planifrous, Lec. .....Larkin, B.C.
Xylotrechus undulatus, Lay. .....Larkin, B.C.
D. valens .....Swan Lake, B.C.
Liptura canadenses, Fab. .....Swan Lake, B.C.
Tetropium velutinum, Lec. (on fir, June 1st, 1912) Coldstream, B.C.
Asenum atrum, Esch (June 20th, 1912) .....Larkin, B.C.
Monohammus scutellatus, Lay. .....Larkin, B.C.
Clerus sphegerus, Fab. .....Larkin, B.C.
R. bicolor (on rose, June 1st, 1912) .....Coldstream, B.C.
Cicindela vulgaris var. obliqua, Kirby.
Cicindela 6-guttata, Fab.
Carabus taedatus near var. agassii, Lec.
Platynus bogemanni.
Adoxus obscurus var. vitis, Linn.
Haltica bimarginata, Say.
Luperodes varipes, Say
Temnochila chloroida, Mann.
Hydrophilus triangularis, Say.
Cucujus clavipes var. puniceus, Mann.
Hippodamia 5-signata, Kirby.
Hippodamia convergens, Guen.
Coccinella trifasciata, Linn.
Coccinella transversoguttata, Hab.
Coccinella 9-notata, Hbst.
Cycloneda sanguinea, Linn.
Eleodes hispilabris, Say.
Eleodes humeralis.
Coniontis ovalis, Lec.
Helops regulus, Blaisd.
Nemognatha dichroa, Lec.
Podabius tomentosus var. pruinosus, Mann.
Cremastochilus pilosicollis, Horn.
Epicauta puncticollis, Mann.
Phytonomus punctatus.
Nocholes torpidus, Lec.
Silpha ramosa, Say.
Dichelonyca vicina, Fall.
Lacnosterna trista, Fab.
Monohammus confusor.

LEPILOPTERA.

Sthenopis argenteomaculatus.

REPORT FROM VANCOUVER DISTRICT: INSECTS ECONOMICALLY IMPORTANT IN THE LOWER FRASER VALLEY.

BY R. C. TREHERNE, FIELD OFFICER, DOMINION DIVISION OF ENTOMOLOGY, EXPERIMENTAL FARM, AGASSIZ.

The object I have in presenting this paper is to record, as best I am able, as a result of the past two seasons' observations, the various insects occurring in the Lower Fraser Valley which are of greater or lesser economic importance to the fruit-growers and farmers. I shall endeavour to describe, for the benefit of all, the

various insects by their most distinctive larval and adult characteristics and their respective injuries to their host-plants, with brief notes on the life-histories under Lower Fraser conditions and remedies suggested for control.

TREE-FRUIT INSECTS.

THE EYE-SPOTTED BUD-MOTH (*Tmetocera ocellana, Schiff*).*

This Tortricid probably ranks first among the various insects attacking the apple in the Fraser Valley. It is destructive only in the larval (worm) stage. The winter is passed in the partially grown larval stage attached to the main limbs and trunks of the trees, securely covered by a silken web. When the buds begin to burst in the spring, the young larvæ cut through their silken coverings and commence to feed on the buds and developing leaves. The larva can be recognized by its colour. It is chestnut-brown, with head, legs, and thoracic shield black, smooth, and shiny. When full grown the larva is ½ inch in length, although in the spring and early summer the larva may vary from ⅛ to ½ inch.

As all the eggs are not laid at one time and as the hatching from the eggs does not occur conjointly with all the individuals, consequently the larvæ enter their winter quarters in the fall in various stages of growth, and, in turn, appear in the spring with the same variations. The result of this is that larvæ continue feeding to all dates until the last days of July before passing to the next stage of its history, the resting stage, or the pupa. The moth is supposed to be single-brooded, no evidence yet being received to indicate even a partial second brood. On the other hand, pupæ may be formed by the more mature larvæ by the first week of June. The pupa may be recognized, in its turn, by its length and colour. It is chocolate-brown in general colour, with the abdominal segments somewhat lighter than the head, thorax, and appendages; each segment of the abdomen possesses two rows of numerous tooth-like processes, while the last segment possesses several hooked bristles used for the purpose of retaining it securely in its place of pupation. Length, approximately ⅛ inch. Pupæ of this description may be found in the dried curled leaves so commonly seen on apple-trees in the Lower Fraser during the summer. The pupal stage lasts from thirteen to twenty days and carries over from the first week of June until well into August. The adult moth, which is ashy grey and capable of expanding its wings about ⅝ inch, then appears from the resting pupa to lay eggs and again produce the destructive larvæ. It is assumed at the present time that all of the eggs hatch and produce larvæ before fall. The eggs are very minute and are laid on both surfaces of the leaves.

The main injury is caused in the early spring, when the young larvæ attack the developing buds, terminal and lateral, preventing the normal growth of shoots and forcing the growth of many side and lateral shoots in place of one, and by affecting the formation of blossom by the attack on fruit-buds. The most efficient remedy is the application of arsenate of lead in the form of a spray at the time of the bursting of the buds and previous to the formation of bloom.

THE LESSER APPLE-WORM (*Enarmonia prunivora*, Walsh).

The life-history of this Tortricid is very imperfectly known, as yet, under our local conditions. It is universally spread over our present fruit areas of the Lower Fraser and Vancouver Island. It is commonly seen in the latter part of the summer, at the time of the fall fairs, on fruit in the orchards. For the reason that its nature of injury closely resembles that of the codling-moth, it was thought advisable to prevent confusion by a brief reference to its characteristics.

The larva of the codling-moth (*Carpocapsa pomonella*, L.), another Tortricid, is when full grown about ¾ inch in length, white or pinkish in colour, with a brown head and faint tubercles over the body. A great proportion of the larvæ of the first

* The scientific and common names for the majority of the insects in this paper are those recommended by the American Association of Economic Entomologists in Circular No. 1, June, 1909.

brood enter the apple through the calyx end, some enter at the stem end, and some, when apples are touching, enter through the side. The well-known excreta at point of entrance leaves a clue to the presence of the larva in an apple. The larva after entering the apple penetrates to the core and there remains until full grown, when, as a rule, it works its way by a different route to the side for the purposes of pupation.

The larva of the lesser apple-worm enters the apples from either the calyx or stem end, and also on the side when apples are touching, in these respects resembling the larva of the codling-moth. The larvæ of the former, however, feed to a greater extent on the surface of the apple, devouring the flesh around the calyx and stem basins to the depth of ½ inch. The larvæ undoubtedly penetrate to the core, as do the codling-moth larvæ, but usually only in well-ripened apples. The larva does not appear to form so definite a channel to the core as does the codling-moth larva, appearing to feed more or less continuously on the flesh of the apple en route. The greatest difference between the two, possibly, is the colour and shape. When full grown the larva is not more than half as long as the codling-moth larva and is more pinkish in colour. Furthermore, the terminal portion of the last segment is furnished with a small brown structure consisting of seven teeth.

It may be readily assumed that an arsenate-of-lead spray applied in the spring and again in July would offer the best remedies.

OLETHREUTES, SP.

There is evidently a leaf-roller of the above genus at work in Lower Fraser orchards which closely resembles the bud-moth in habits. The adult moth is larger throughout, however, but of an ashy-grey colour. Its occurrence in the field is very local, and thus far has not been observed in great numbers.

Mr. Arthur Gibson, Chief Assistant, Dominion Division of Entomology, to whom the adult was referred, believed it to be of the above genus and similar to the Eastern species *nimbatana*.

THE FALL WEB-WORM (*Hyphantria cunea*, Dru.).

In 1903 the webs of this Arctiid were very conspicuous in British Columbia.* In recent years this insect has not been so common, but the well-known webs can be observed at times in the Lower Fraser Valley.

The full-grown larvæ are about 1 inch long, covered with long black and white hairs which project from numerous black tubercles. They feed on the foliage of fruit-trees and woodland shrubs, and are confined within a thick silken web and thus are readily distinguishable. Arsenate-of-lead spraying when the larvæ are quite small in the middle of summer, or the removal of the webs when they are more mature, will prevent marked injury to the trees.

THE TENT-CATERPILLAR (*Malacosoma erosa*, Stretch).

Has not been prevalent during this past season. It is subject to years of prevalence and scarcity. It is apparent that parasites play an important part in the natural control of this insect. The following description of the larva is taken from Prof. H. F. Wilson's report of the Division of Entomology in the Biennial Crop Pest and Horticultural Report, 1911-12, Corvallis Experiment Station, Oregon, relative to the species:—

"*M. Erosa.*—Whitish, irregular oval spots on middle of back on all but the first few segments. On either side of these spots and somewhat separated from them is a broad blue band bordered on either side by a brick-red line. Below that, on either side, and reaching to the legs, is a bluish space, characterized by one blackish dot on each segment marking the position of spiracles or 'breathing-holes.' Below the

* 1903. James Fletcher, Annual Report Experimental Farms, Canada, under H. textor. Harr.

caterpillars are dark blue, with oval spots in median on all but first few segments. Over the whole of the caterpillars are numerous, fine, yellowish or cream-coloured hairs."

Insects of this species attack all orchard trees in the Lower Fraser with the exception of the pear, which apparently appears immune. The nature of the injury from these caterpillars is so well known that further reference is unnecessary. Suffice it to say that spraying with arsenate of lead in the early summer and the mechanical destruction of the larvæ are recommended in years of prevalence.

THE APPLE FRUIT-MINER (*Argyresthia conjugella*, Z.).

In 1898 Dr. Fletcher, the late Dominion Botanist and Entomologist, referred to this insect as one of the worst enemies of the apple-grower in British Columbia. Of recent years its presence has not been noted.

THE PLUM-CURCULIO (*Conotrachelus nenuphar*, Hbst.).

It has been considered advisable to mention the characteristics of this insect. The adult is a thick-set snout-beetle about ¼ inch long, and it lays its eggs in peculiar but characteristic crescent-shaped punctures on the skin of many orchard fruits, particularly the apple, peach, and plum.

The female weevil first removes a portion of the skin of the fruit with her snout and in the cavity thus formed deposits an egg. She then, by instinct, cuts portions of the skin of the fruit in either direction from the point of oviposition, so that as the fruit swells and grows the pressure will not crush the eggs, the expansion being alleviated around the egg by the two latter formed incisions. Thus a characteristic crescent-shaped puncture is produced. These shaped punctures have been observed on some apple-trees for a long time neglected, growing at Agassiz this summer. Furthermore, verbal reports of the same have been received from Salmon Arm. No eggs, larvæ, or adults have been taken, but as this insect is regarded as one of the worst affecting the fruit orchardist in other portions of Canada, it is well that a sharp look-out be kept in British Columbia.

THE CHERRY FRUIT-FLY (*Rhagoletis cingulata*, Loew).

"This imported insect was recorded by Dr. Fletcher in 1906. He received it from Mr. W. R. Palmer, Victoria, B.C., where it was injuring some cherries. This was its first recorded appearance in Canada, and Mr. Palmer stated that he first noticed the holes in cherries in 1904."*

No further records appear to have been received during recent years regarding this insect and it is hoped it will not appear again. The adult is a fly and it lays its eggs just beneath the skin of the cherry during the summer. Maggots about one quarter inch long may be found in the flesh producing a rot of the fruit.

THE WOOLLY APPLE-APHIS (*Schizoneura lanigera*, Hausm.).

This aphis is probably the commonest-known insect of its class to the fruit-grower in the Fraser Valley. Its conspicuous white flocculent clusters in cracks and crevices of limbs and in pruning scars at once indicate its presence. Root-forms also occur, forming swellings and scars on the finer roots of the trees, but as these forms are hidden from view their importance is lost sight of. The secondary injury caused, allowing fungous disease access to the tree, is as important as the attack on the tree by the aphis itself.

During the winter, on the stems will be found masses of the dead bodies of the summer's generations, but underneath, protected from the effects of temperature, may be found several small aphides of a brown colour. If these survive the winter, as many probably do, in the milder parts of this Province, they commence to migrate to the new wood of the past summer, when the buds begin to open. They begin to

* Extract Annual Report, Dr. C. Gordon Hewitt, Dominion Entomologist, March 31st, 1911. Experimental Farms, Canada.

feed by inserting their beaks into the wood and produce a white waxy excretion as they grow. These all prove to be females, and each one is capable of producing young, which, in turn, produce more young, and so on until early in the fall, when winged forms are produced. These winged forms are black to the unaided eye, with distinct black nerved wings. At this point there appears to be a certain amount of doubt at the present time as to the next step in the life-history. It is supposed that some of these winged forms migrate to the elm and there produce several male and female aphides, which in turn produce eggs.

The actual life-history under Lower Fraser conditions has not, I believe, been studied; consequently we cannot do more at the present time than regard the researches of other investigators as approximate to our own.

The aphides on the stems can best be controlled by a weak dilution spray of kerosene emulsion or by summer-strength lime-sulphur with an addition of Black Leaf 40. Where root-forms are known to exist, these same sprays applied to the roots may be used, allowing the liquid to reach the aphides by partially removing the soil around the tree.

THE ROSY APHIS (*Aphis sorbi*, Kalt).

This aphis occurs in the Lower Fraser, but its presence and the injury caused is probably not associated to the average grower. The fruit is not attacked, but by the indirect influence of the aphis attack on the fruit-bearing spurs and adjoining leaves, the fruit becomes knarled, irregular, and misshapen. These clusters of poorly shaped fruits are commonly to be seen in any orchard of the valley, but we have no definite idea, as yet, on its prevalence or degree of injury in comparison with the attack of other aphides. It is altogether probable that we will find this species the most serious aphis pest of our apple-trees unless due regard is paid to its control.

The life-history of this insect is, like the woolly aphis, only imperfectly known. Colonies may be found on fruit-spurs and in the curled leaves adjoining the blossoms in the spring. These colonies have sprung from an over-wintering egg laid the previous fall and are wingless. Several generations occur during spring and early summer. At Agassiz, at the latter part of June and during early July, winged forms appear and they migrate in numbers from the apple-leaves to some unknown host-plant. All efforts to trace the secondary host-plant failed this past summer. According to Prof. H. F. Wilson, of Corvallis, Oregon, this spring migrant "is in general colour black, abdomen brown, with black markings and a black dorsal square-shaped spot. The antennæ are about as long as the body and brown to black. Along each side of the abdomen is a series of dentate tubercles." Later in the year, about September, winged females return again to the apple, giving birth to several forms, which in turn produce eggs.

The knarled appearance of the fruit in the clusters and the absence of any assignable cause, by the migration of the summer forms is liable to confuse the grower, who may expect an explanation of the condition of his fruit.

The remedy suggested has proven itself very efficient, and referring again to Prof. Wilson's work in Oregon, for want of any local experience of our own, we quote: "Lime-sulphur should be used, winter strength, and Black Leaf 40 added at the rate of 1 part to 900 parts of the diluted lime-sulphur. It is very essential for success that this spray be applied just as the buds are opening into leaf. When the leaves commence to curl, spraying cannot be accomplished with proper results."

THE EUROPEAN GRAIN-APHIS (*Siphocoryne avenæ*, Fab.).

This aphis occurs commonly on the apple in the Lower Fraser, being often found associated in the colonies of *Aphis sorbi* in the spring on the leaves. Apparently the life-history resembles that of *Aphis sorbi* in the general details, with the exception that more is known of its hosts. It uses the apple as the host in the spring and fall, migrating to small grains and grasses during the summer. At Agassiz, during

the past summer, these aphides under observation migrated to young wheat-plants in the latter part of June. The remedies recommended are similar to those for the rosy aphis.

The Apple-aphis (*Aphis pomi*, L.).

This common green aphis is present in all orchards, and is universally recognized by its habit of clustering in great numbers on the new shoots and under the fresh green leaves of the apple. The shiny black eggs are also common sights to the orchardist during the fall and spring on his apple-trees. The same remedies as before suggested are again of value in controlling this pest, an early application being again necessary. It might be mentioned that the eggs are not amenable to practical treatment.

The Cherry-aphis (*Myzus cerasi*, L.).

This black aphis may be found throughout the summer in the curled leaves of the cherry-tree. The lime-sulphur and Black Leaf 40 spray is again of benefit in the early spring.

The Oyster-shell Scale (*Lepidosophes ulmi*, L.).

This Coccid is very common on all classes of trees in the Fraser Valley. The moist, humid climate of the immediate coastal region is particularly well suited to its life and reproduction. The scale can be recognized from its well-known shape, such as its name implies, and is known to all orchardists. In a general way the scale is not dangerous, as the methods of orchard-culture tend to retain its numbers within reasonable bounds. Branches of trees, however, and, in rare cases, whole trees in neglected orchards or woodlots may be killed by the effects of this scale alone. At certain points in the Fraser Valley wild crab-apple trees may be seen standing dead by the roadside. Undoubtedly the oyster-shell scale and the tent-caterpillar have combined forces to cause their death, but while we do not mourn the loss of these wild crab-trees, yet they stand as examples of what might happen in the orchard if proper precautionary measures are not taken.

The female scale is about ⅛ inch in length, usually dark brown in colour. In the spring a few may be grey, but this is apparently the result of winter or old age. The male scale resembles that of the female in shape and colour, but is considerably smaller. Eggs are laid in the fall under the scale of the female, and if one of these scales be removed during winter, numerous small white eggs (from 40 to 100) will be noticed.

In the spring these eggs hatch, producing some very minute yellowish insects which are comparatively active soon after hatching. In time each individual will settle down, insert its beak into the plant and commence to suck the sap. At this time the insect is free of any covering or "scale." However, as it grows and molts a waxy excretion covers the body, forming gradually the characteristic "oyster-shell scale." The female scale remains at the one point throughout her life and becomes full grown in from two to three months. The male scales continue their stationary feeding until full grown, when they develop two very minute and delicate wings, fertilize the female, and die. The female insect then, in turn, produces eggs under her scale and dies, and the eggs pass the winter as such, awaiting spring before they hatch. Thus the scale is single-brooded and only capable of producing up to 100 individuals per individual during the season.

As regards remedies, it has been found that the lime-sulphur spray has little effect on the eggs during winter, except perhaps a number of old scales and eggs may be loosened and washed from the tree, but is very efficient against the young insects hatching in the spring. Watch should be kept to determine when this hatching takes place, but as a rule it occurs after blossoming. In the Lower Fraser Valley apples begin to bloom the last days of April, and they bloom for a month; consequently one might spray summer-strength lime-sulphur the second week of May or thereabouts. As a general rule, it will not be necessary to spray every year for this

insect, but as often as the careful discretion of the grower would warrant. It should be remembered that this statement refers only to this insect. In cases where trees have become very badly encrusted with scales, mosses, and lichens, it would be well to apply a dormant winter spray of either a 3-per-cent. caustic-soda solution or 1 lb. of Gillett's lye in 4 gallons of water. This procedure is better not followed more than one in four or five years, as it has a tendency to hidebound the trees.

The scale is heavily parasitized in the Fraser Valley.

THE RED-HUMPED APPLE-TREE CATERPILLAR (*Schizura concinna*, S. & A.).

The name of this caterpillar is obtained from a prominent red hump on the fourth segment of its body. Specimens of the larvæ of this species may at times be met with devouring the leaves of apple-trees. A simple spraying of arsenate of lead will effectively control them.

THE CIGAR-CASE BEARER (*Coleophora fletcherella*, Fernald).

At every orchard in the Lower Fraser visited during the past two years this insect has been found to occur. It cannot, however, be classed as one of the important insects of the orchard. The grower may recognize the species when a small cigar-like case is seen standing erect on the surface of a leaf. This case contains a small caterpillar which feeds on the surface of the leaf. The winter is passed as the larva in its case attached to stems and twigs. Migration to the leaves occurs in the spring, and the adult moths appear in July, giving rise to the next season's generation. Arsenate of lead applied either before or after blossoming will control this species.

THE PEAR-SLUG (*Eriocampoides limacina*, Retz).

A smooth slimy-looking slug may often be met with on the leaves of cherry, pear, and plum. This is the larva of a sawfly. The adult is about ⅕ inch long, black, somewhat shiny, with four wings, rather dusky in appearance, which are folded over the abdomen when at rest on a leaf.

Adults have been observed flying in the Fraser Valley during May and early June, depositing eggs. Small blister-like areas may be seen on the upper leaf surface, indicating that an egg has been deposited there by the female. Minute larvæ (slugs) have been observed on the leaves during the second week of June. The first brood of larvæ evidently commences about this time. From the middle till the end of July the period of pupation is in progress, as but few slugs can be found on the trees.

During the last days of July and early August adults may again be seen flying and depositing eggs, so that during August and September larvæ are quite common again. Thus this insect in the Lower Fraser is double-brooded. The first larval brood of June may cause injury to the tree, but by arsenate of lead or pyrethrum powder they can be combated. The second brood of larvæ in August can almost be classed as a benefit to the tree, for the attack by defoliation checks the growth and assists the tree to ripen its wood for winter.

CLICK-BEETLES (*Elateridæ*).

During the month of May in the Fraser Valley, when the apples are in bloom, large numbers of elater or click-beetles may be seen clustered around the blossoms and developing buds. Several species appear to be involved at the one time. By an experiment, performed to find out what damage was caused, it was shown that these large black beetles were cutting off the pistils and stamens of the blossoms, devouring the calyx-cup and the petals as well as developing leaves of the tree.

There is no question at all that a large number of prospective fruits are destroyed by the destruction of the blossoms and the calyces. Furthermore, the depredations of these beetles are continued during the summer upon leaves and young fruit. Portions of the epidermis and pith of the apple will be devoured. These areas heal over, but fruit attacked in this way, later in the year, show brown and depressed areas on its skin, greatly injurying the marketable appearance of the fruit.

This form of injury is, so far as known, practically unrecorded; consequently we are unable to advise any definite course of remedy. Arsenate of lead applied in the spring might have the right effect so long as the blossoming period and the setting of fruit were not interfered with.

THE FRUIT-TREE LEAF SYNETA (*Syneta albida*, Lec.).

This is another species of beetle found in early spring attacking the blossoms of apple-trees. Its comparative economic importance is not known.

THE BRONZE APPLE-TREE WEEVIL (*Magdalis ænescens*, Lec.).

Is present in Lower Fraser orchards, and appears to be secondary and associated with the canker of the stems and trunks of apple-trees. The egg-chambers may be recognized in the bark by a series of minute punctures closely congregated. The adults may frequently be seen in the spring in the vicinity of blossoms and on the new leaves. We have no evidence as yet that this insect is of sufficient economic importance to warrant attention.

THE PEAR-LEAF BLISTER-MITE (*Eriophyes pyri*, Pagnst.).

This Arachnid is to be found in every orchard visited in the Lower Fraser Valley. Its work can be recognized by the rusty, rough, blister-like appearance of the under-surfaces of the leaves. The mites are microscopic in size and can only just be seen with a lens; consequently the orchardist may account for the apparently unassignable cause for the appearance of his leaves. The mites pass the winter in the egg stage in the buds, hatch in spring, and migrate to the leaves when the buds are expanded. Here they burrow between the two surfaces of the leaf and feed and set up an irritation which produces at first the rusty-brown colour on the surface, which later becomes black.

To control these animals great care is required. Lime-sulphur or Bordeaux mixture, or any of the oil emulsions, applied in the fall or spring, under pressure, will be found quite efficacious as remedies.

THE APPLE-LEAF HOPPER (*Empoasca mali*, LeB.).

Causes the peculiar white specking of apple-leaves. Caustic or soap sprays applied in the spring, with special attention being paid to the under-surfaces of the leaves, will retain these insects within reasonable bounds.

SMALL-FRUIT INSECTS.

THE STRAWBERRY-ROOT WEEVIL (*Otiorhynchus ovatus*).

The larva of this weevil is a small white grub which when full grown is about ⅜ inch in length. It is commonly found in the soil of a strawberry plantation among the roots of the plants, which it devours readily and causes, in so doing, rapid deterioration of the field. The adult is a small dark-brown almost black beetle about ¼ inch long. It feeds during the night on the leaves, forming irregular feeding areas on the edge of the leaf. In the adult stage it has not proven destructive, and the appearance in houses during the summer and in fall is not indicative of any harm. In the larval stage it is of great economic importance, and as such is the worst enemy of this class of fruit. The eggs are laid during June, July, and August in the soil to the depth of ½ inch. The larvæ feed lightly on the roots until fall and pass through the winter without causing untoward injury to the roots. In the spring the larvæ continue feeding ravenously until the pupal stage is reached in May and June. From these pupæ which are formed in the soil, from 1 to 3 inches deep, the adults emerge to continue the generation. In the Fraser Valley the weevil is single-brooded and in habit inclined to be gregarious, which means that, provided sufficient food and shelter is at hand, they do not move very much and remain congregated in infestation areas. From these considerations it has been found that plantations suffer more each succeeding year of growth, it frequently happening that

the third season of growth is rendered unremunerative in yield of fruit. All efforts to control this weevil by artificial methods or spraying have proven more or less unsatisfactory. However, by judicious management of crops, by rotation, thorough cultivation, by the use of chickens, and the growth of suitable varieties, the depredations of the weevil will be much alleviated.

THE BLACK VINE-WEEVIL (*Otiorhynchus sulcatus*).

This species is similar in habits to *O. ovatus*. It is larger throughout in all its stages. It is found in strawberry plantations to a minor degree as compared to the smaller species. This species may be mentioned as being more troublesome to garden and greenhouse plants than to strawberries.

SPITTLE-INSECTS (*Cercopidæ*).

Are frequently met with in strawberry-fields and in grass and garden plots, and may be recognized by the objectionable saliva-like substance that surrounds them. The amount of their injury, beyond rotting the fruit it may be in connection with, is not very extensive, and no control measures have been proven essential. Should such be required, however, kerosene emulsion applied with pressure will be of use.

THE CURRANT-BORER (*Ægeria tipuliformis*, Clerck).

The adult insect is a moth. It is probably not known to the average grower in the Fraser Valley as the cause of injury to his currant-bushes. Local observations on this insect indicate that the moths are flying the second week of June. On any bright, sunny day at this time of year, by carefully watching the currant-bushes and surrounding vegetation, the moths may be seen darting rapidly about in the air, resting at times on the leaves of plants. On dull days they are not so active, for it would seem that the bright, warm days of summer are more in accord with their nature. If one of these moths be captured, it will prove to be one of the most beautiful of the many insects of the orchard. It is a clear-winged Sesiid about ½ inch in length, with a body of a steel-blue lustre with several bright golden bands around the neck and across the abdomen, while on the last segment is a prominent tuft of long scales.

At the latter part of June the female has deposited her eggs; in one case, under observation, eighty eggs were laid by a single moth. The eggs were very small and yellowish in colour, and were tucked away under corrugations of the bark of the bushes in axils of buds and under the edges of lichens which grow so frequently on the stems of shuts and trees in the valley. On July 1st the larvæ had hatched from the eggs and had penetrated to the pith of the stems, small amounts of cast-off material indicating the point of entrance. The larvæ feed on the central pith of the currant-bushes and they become half-grown at the approach of winter. The following spring feeding and growth is continued uninterruptedly until May. The full-grown larva is about ½ inch long, yellow, with a brown head. The pupa is then formed in the pith, and it remains dormant about fifteen days until the adult moth is ready to emerge. When ready, the pupa forces its way through a hole to the outside of the stem until it protrudes nearly its whole length from the stem. The anterior portion then breaks open and the adult moth appears ready to commence the generations again.

Affected bushes will show a slight yellowing of the leaves and a general dwarfed appearance of the plant. The insect is very common in the Lower Fraser Valley on currants, and no evidence has as yet been given where bushes die from the effects of this moth alone, although in severe infestations such may prove the case. The remedy is comparatively simple. Prune out all the old wood in the early spring or in late fall and burn the cuttings. The standard form of bush should also be avoided.

THE CURRANT FRUIT-FLY (*Epochra canadensis*, Loew.).

Dr. Fletcher in 1901 reported this insect injuriously prevalent on Vancouver Island and in the Lower Fraser Valley. It is probable that it is still present in

the immediate Coast regions, but not in sufficient numbers to attract attention from fruit-growers. The dryer portions of the Province appear to suit this insect, for from there it is reported recently of economic importance. In short, the adult is a small fly with a fine tapering abdomen. In the early summer the female fly will deposit her eggs just beneath the skin of the fruit and the maggots will devour the pith and seeds. When ready to pass to the pupa, the maggot burrows out of the berry and will drop to the ground, where it pupates just below the surface.

Chickens and cultivation will assist in controlling this insect.

Truck-crop Insects.

The Potato Flea-beetle (*Epitrix cucumeris*, Harris).

This insect is common to the Fraser Valley and may be seen as minute black specks on the surface of potato-leaves during the summer. The adults devour portions of the epidermis of the leaf, and when disturbed hop freely to great distances. The larvæ and pupæ are found in and around the roots of the plants in the soil. Reports of injury from this insect have been received from the Coast since 1901.*

The adults are very minute, being only about 1/16 inch long, jet black, with yellow antennæ and legs. They are mainly destructive in the early spring, but can be controlled by the use of arsenate of lead. The arsenate can well be mixed with the Bordeaux mixture which is used to offset the ill effects of blight and fungous diseases of the plants. Nicotine sprays are believed to be equally efficacious.

The Red Turnip-beetle (*Entomoscelis adonidis, Fab.*).

This beetle has been reported at Hazelton and points north of Lillooet, B.C., and from as far north as Dawson, Y.T., as destructive to cabbages and turnips.† During the past summer a report, without specimens, was received from Fort George, probably referable to this insect. It would appear that arsenate of lead would again prove applicable for control.

The Cabbage-maggot (*Pegomya brassicæ*, Bouche).

This insect is by far the most serious and important one attacking cabbages, radishes, turnips, cauliflowers, celery, rape, and the various wild cruciferous plants in the Lower Fraser Valley. It yearly exacts a toll from gardeners and farmers far exceeding any other insect of its class. More requests for satisfactory control measures are yearly answered about this insect than any other in the valley. It must be admitted, however, that we yet await a satisfactory and practical remedy applicable, in particular, to field conditions.

The adult is a small fly, smaller but resembling the common house-fly. It appears in April in the Fraser Valley, ready to lay eggs on young cabbage and other plants.

The eggs are laid against the plant-root on the surface of the ground. They are white and thus readily distinguishable to the unaided eye. Small footless white maggots emerge from the eggs and penetrate the root. Here they continue to feed and grow to approximately ⅓ inch long before passing to the pupa in the soil. From the pupa the fly eventually emerges, giving rise to further individuals. The entire individual life-history carries over approximately two months, and two and probably a partial third brood occurs during the summer. The life-history under strictly local conditions has not yet been properly studied; consequently we are unable, as yet, to state exactly what occurs at the latter part of the season. Larvæ in cabbage-roots have been taken in December at Agassiz.

The control of this maggot has been experimented with at Agassiz during the past summer, and while it is not proposed to give the results at this juncture, a few significant points may be stated, and judged accordingly as passing results.

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* Dr. J. Fletcher, Annual Report, Experimental Farms, 1901.
† Dr. J. Fletcher, Annual Report, Experimental Farms, 1905-1906.

It is proposed to continue the investigations during the next and future seasons. The main mixture experimented with was the carbolic emulsion. This mixture is made by dissolving 2 lb. of soft soap in 2 gallons of warm water, to which is added 2 pints of crude carbolic acid. This stock solution is then diluted 1-20 and applied at the rate of 5 oz. to each cabbage.

It was figured that 10 cents' worth of the diluted mixture would treat 100 plants once at this rate, not including the cost of labour. It was necessary to treat each cabbage seven times between the end of May and the middle of July; consequently the cost per 100 plants was approximately 70 cents, exclusive of labour.

The past summer's work indicated that the above mixture applied seven times only held a balance in favour of treatment of 33 per cent., covering a great many varieties of cabbages. There is undoubtedly much variation in the degree of resistancy between the various varieties of cabbage; consequently it is not fair to judge the 33 per cent. with too great a degree of detail. It is merely wished to point out that the carbolic emulsion, which is the most recommended mixture for control, has not offered perfect results from treatment.

A greater benefit than maturity was noticed under the above treatments in the individual comparative weights of the cabbages harvested. Without going into details again with the various varieties, it was found that, covering the whole experiment, a net increase of approximately 2 lb. per individual cabbage was figured in favour of the treated cabbages over those left untreated. Quicker maturity of the treated plants also resulted.

The diluted mixtures did not harm any cabbage, not even those in the seed-bed, when treated while growing. Dipped plants at transplanting were apparently checked somewhat, but in the main survived. The eggs were not affected by treatment by either carbolic or kerosene emulsions.

In a large turnip-field experiment performed at Agassiz two significant points appear to have been demonstrated: (1.) The net results in weights of turnips harvested on equal proportions of an acre from roots treated with solutions of kerosene and carbolic emulsions over untreated roots do not warrant the time, labour, or expense of liquid treatment of the roots. (2.) That thinly seeded rows possess more eggs and maggots per root than thickly seeded rows, and that the process of "thinning" the roots in the row again affects the infestation per individual. Consequently, from the past summer's experience, it would seem advisable to seed heavily—roughly, sixty to eighty plants to the lineal foot—and follow this by "thinning" in the month of June.

Experiments performed by others in the past have indicated that good success may follow the use of thin felt-paper tarred disks placed around the neck of cabbages and cauliflowers flush to the ground; that radishes may be screened against the fly; that the old cabbage-stalks and refuse left around the field had best be destroyed as soon as the crop is harvested; and that rotation of land be practised as far as possible.

THE IMPORTED CABBAGE-WORM (*Pontia rapæ*, Sch.).

According to the late Dr. Fletcher in his Annual Report of 1901-1902, this insect was first recorded at Kaslo in 1899. It proved very troublesome in 1901, having spread over the entire Province. During the summer of 1900 it reached Vancouver Island. This insect of recent years, though present, has not attracted very much attention from gardeners and farmers. The white butterflies are noticed early in the spring and are known to all. The caterpillars feed on a number of plants of the cruciferous family. They are green in colour and over 1 inch in length when fully mature.

Arsenate of lead applied before the cabbages "head out" will be found the best remedy.

THE CUTWORMS (*Peridroma saucia*, Hbn.; *Eupsephopoectes procinctus*, Grt.).

Are both recorded for the Lower Fraser Valley. These troublesome insects are known to all, and at times, in years of prevalence, become very destructive. They can be controlled when their damage is observed by the use of a mixture of bran, molasses, and Paris green. The "worms" as a rule only feed at night, so if this mixture is placed near the plants in the evening many cutworms will suffer from the effects of the arsenic.

THE ONION-MAGGOT (*Phorbia cepetorum*, Meade).

Is a species very similar to the cabbage-maggot in characteristics and habits, and can be controlled the same way, with the addition that affected plants can be pulled up whenever seen during the season.

GREENHOUSE AND GARDEN INSECTS.

THE CHRYSANTHEMUM LEAF-MINER (*Phytomyza chrysanthemi*, Kowarz).

This insect is very common in and around the City of Vancouver. It is principally destructive as a greenhouse insect, attacking white daisies and chrysanthemums. It is believed also to breed in the leaves of wild plants in the open.

The adult is a very small black fly, somewhat sluggish in its movements. It lays its eggs just beneath the epidermal layer of the leaf, and the larvæ mine and feed between the two surfaces. Pupæ are formed in the leaf and can be observed to have punctured the epidermis of the leaf to render the escape of the fly somewhat easier, and possibly also for breathing purposes. From the pupæ the fly eventually emerges, to again begin the cycle of life. The generations appear to be very rapid, especially under the heated conditions of greenhouses; consequently a continuous watch must be kept for the fly and the larvæ.

It is believed that the nicotine extracts would prove beneficial as a control for the larvæ and pupæ within the leaves. Hand-picking of the affected leaves is of value, but is troublesome. Both measures followed closely by sulphur or hydrocyanic-acid gas fumigation to prevent the flies from depositing eggs would probably reduce the numbers of the insect effectively.

THE TARNISHED PLANT-BUG (*Lygus pratensis*, L.).

This Capsid has been reported and observed destructive to dahlias, carnations, and chrysanthemums in British Columbia greenhouses. From its proven omnivorous habits it probably attacks many more plants than observed. The adult is about ¼ inch long, somewhat shield-shaped in outline, brown in colour, marked with black, red, and yellow. The displacement of the colour and markings is variable.

Unlike the majority of insects mentioned throughout this paper, which pass from an egg to the larva, to the pupa, and thus to the adult, this Capsid passes from the egg to the nymph, which grows and moults several times before attaining the size and appearance of the full-grown adult. Consequently we may find stages of the nymphal period all at work on our plants conjointly with the adults.

Messrs. F. H. Chittenden and H. O. Marsh, in the Journal of Economic Entomology, Vol. 3, 1910, claim that the eggs of this species are laid on a variety of plants, among them being the kale, turnip, and mullein, on the upper side of leaves, in petioles of leaves and in the stems of plants. From these eggs the nymphs hatch and commence to suck the juices of the host-plants. This insect, while being of economic importance to the farmer, has become a nuisance to the greenhouse gardener. It will attack the young developing buds and flowers of the plant, sucking the juices from one side, so that as the bloom opens up it will be found to have developed on one side only, or malformations in a variety of ways takes place, which hinders the market value of the cut bloom.

As a control in the greenhouse, kerosene emulsion or one of the nicotine extracts sprayed in weak dilution, perferably as early in the morning as possible,

owing to the fact that the bugs are less active at this time of day, will retain the insects within reasonable bounds. For further efficiency spraying had best be carried on more or less once a week.

THE GREENHOUSE THRIP.

It is popularly supposed among florists in Vancouver that this Thrip is a more economic pest than the before-mentioned tarnished plant-bug to bloom in the greenhouse. It is claimed that injury to chrysanthemums is different to the injury caused by the "bug"; that the bud is attacked at an earlier stage by the Thrip, and that the entire bud is destroyed and "thrown blind." We are not in a position to state definitely the actual state of affairs without further study. The main injury by the Thrip is caused to the leaves, which it readily attacks, with attendant loss to the plant. The injury to the bloom is questionable as yet, there being a certain confusion in the respective attacks of the "bug" and the Thrip.

The same control measures as applied for the "bug" will apply to the Thrip.

THE BULB-MITE (*Rhizoglyphus hyacinthi*, Boisd.).

This mite is considered from many shades of opinion. Some of the most prominent entomologists of the United States claim great damage due to the mite, and claim no infected bulbs should reach the planter; others acknowledge the undoubted and primary injury to bulbs by the mites, but their universality and habits prohibit satisfactory quarantine measures, inspection, or control; while others, again, consider the mites as secondary in importance and injury. This mite is present in British Columbia to-day, but we can offer no data as to the extent of its actual injury. Specimens of this mite arrive every year from Europe and Japan, and it is doubtful whether any consignment of bulbs can be considered free. The mites so commonly seen in onions and decaying roots, cabbages, or vegetable matter are probably referable to the same species. There is no doubt that these mites are capable of being the primary injury to sound bulbs, but from their usual association with injuries caused by rots and other insects in roots and bulbs, it is probable that more often their presence is secondary.

The economic status of this animal is only recent in study; consequently no control measure can be considered.

NARCISSUS-FLY (*Merodon equestris*, F.).

Mr. Priestly Norman, of Victoria, in the Proceedings of this Society for 1911, has published as extensive a paper on the habits and prevalence of this insect in this Province as we have for reference. Dr. C. Gordon Hewitt, Dominion Entomologist, in his Annual Report for 1911, refers to this insect under British Columbia conditions, as follows: "In British Columbia it is now a serious pest of bulbs, and Mr. A. E. Wallace reported it as attacking narcissus and daffodil bulbs near Victoria, B.C., about 50,000 bulbs having been destroyed in the year."

We gather, therefore, that this insect is a most serious one on Vancouver Island. Mr. Norman believes it was imported into British Columbia about 1904 on bulbs and has been allowed to increase. On the Mainland, in and around Vancouver, this insect is most decidedly gaining in importance and prevalence. From reports from owners of gardens in the City of Vancouver and from personal observations, it would appear there has been a decided gain in the numbers and injuriousness of this insect within the city. No special endeavour has been put forward up to the present to instruct people in regard to this insect, and, as mention of it has been spontaneous, we are safe in assuming that the insect is gaining ground and liable to become a serious pest.

Mr. Norman, in referring to this insect, desires it to be known that he has only judged this insect somewhat impersonally, and that the following life-history notes are merely opinions gathered from the practical association with bulb-growing.

The adult is a fly resembling a horse-fly, and may be seen from the end of March till September. It is more commonly observed in May. The point of egg-deposition

is in the crown at the surface of the ground. The "grub" or larva then finds its way to the heart and here feeds, grows, and sets up a rot in the bulb. The larva will then remain in the bulb until the following February, when it vacates the bulb and changes to the pupa state about ½ inch below the surface of the ground, and from there hatches to the fly. "The true narcissus type is most susceptible to attack, then come the intermediate season daffodils. *Recurvus* and *Barii conspicius* are most subject to attack, while 'Henry Irving,' 'Golden Spur,' and 'Princeps' are almost free as are the late daffodils."

Quoting the report of Dr. C. Gordon Hewitt: "The method of eradication which has been found most simple and efficient in Europe is the annual lifting of the bulbs and the destruction of all those which are found to be attacked by the maggots as can readily be seen."

Consequently, in the spring and fall, when bulbs are planted and dug, care should be taken in selection and bulbs found infested should be destroyed. The grub can be detected by pressure of the bulb, indicating a softness within, or by an examination of the root-crown, where infested bulbs will show a point of entrance. The grub may vary in length, but it attains a growth of ¾ to 1 inch in length and is broad in proportion. Bulbs should not be left in the ground throughout the summer.

ROSE-LEAF HOPPER.

Frequently rose-bushes and other garden plants will exhibit their leaves finely speckled with minute whitish or yellow dots. Later the dots form areas of discoloration which are white or yellow at first, but later may become brown. On the under-surface of the leaf minute yellowish green insects which hop freely when disturbed will be found. They are the cause of the mischief. It is believed that the winter is passed in the egg stage under the bark of the new wood. In the spring these eggs hatch to form small active nymphs which are at first wingless, but gradually grow by successive moults to the fully winged hopping individual. These adults will have developed by June.

The best remedies are the soap emulsions, kerosene emulsion being particularly satisfactory applied in the form of a spray during May. Particular attention should be paid to forcing the spray to the under-sides of the leaves.

THE OBLIQUE BANDED LEAF-ROLLER (*Archips rosaceana*, Harr.).

This insect is common in Vancouver and is the cause of much disappointment to the amateur rose-gardener. The larva is generally light green in colour, with a dark-brown or black head, and is found in a curled portion of a leaf. It readily devours the leaf, clustering several leaves together, making the bush unsightly. When disturbed, the larvæ become very active, wriggle away, and drop from their nest by means of a thread.

The most annoying injury caused is to the young blossom-bud in the spring. When the rose finally blooms it will be found to be riddled and perforated by a number of feeding areas, totally spoiling the appearance. Frequently the entire bud will be destroyed. When the larva has become full grown the pupa is formed, being light to dark brown in colour and about ¾ inch long. Later from these pupæ the moths appear. In Vancouver they fly the first days of July, being attracted in great numbers to electric lights. In general colour they are brown. It is believed that a second brood of larvæ appear in August and September.

As a control, arsenate of lead at the rate of 1 oz. to a gallon of water at once commends itself as an efficient remedy for the larvæ, applied in the form of a spray at the early part of the Spring. Trap-lights set in pans of water will also catch many moths in July.

In summarizing the essential times for spray application to apples in the Lower Fraser Valley, we deduce the following:—

Insect.	Spray.	With what.
Bud-moth	In April	Arsenate of lead.
Lesser apple-worm	In April and in July	Arsenate of lead.
Leaf-roller	In April	Arsenate of lead.
Fall web-worm	In July	Arsenate of lead.
Tent-caterpillar	In June	Arsenate of lead.
Woolly aphis	In April and June	Kerosene emulsion.
Cigar-case bearer	In April or June	Arsenate of lead.
Pear-slug	In June	Arsenate of lead.
Click-beetles	In April	Arsenate of lead.
Rosy aphis	In April	Lime-sulphur and Black Leaf 40.
European grain-aphis	In April	Lime-sulphur and Black Leaf 40.
The apple-aphis	In April	Lime-sulphur and Black Leaf 40.
Oyster-shell scale	In June	Lime-sulphur.
Pear-leaf blister-mite	In April or September	Lime-sulphur.

From the above it will be seen that the two essential mixtures are lime-sulphur and arsenate of lead. Black Leaf 40 is also of use against aphides. These three ingredients can be mixed together satisfactorily without injury to the relative effectiveness of any one. It will be seen also that the first spraying on apple-trees is required during April or at the time when the buds are breaking and previous to the formation of blossom. The second spraying should take place in June or after the blossoms have fallen. The third or midsummer sprays will only be required during exceptional cases and relative to special insects. The same applies to the fall sprays and winter spraying. The first two sprayings are necessary, one year with another, in every orchard in the Lower Fraser. The later sprayings are optional to the grower, and need only be applied in special cases of severe infestation and as specially directed remedies against special outbreaks. It should be borne strictly in mind, however, that these spray recommendations can be considered only from the standpoint of the insects. The various fungous diseases are probably more serious to the apple-grower than any existing insect attack, and these diseases have to be fought by special methods and at special times. From information at our disposal, we are informed that three sprayings a year are necessary in the majority of orchards in the valley. The first two coincide with the first two insect sprays—viz., in April and in June—and the third takes place in the fall, in September or October, depending on climatic conditions of the year and as to whether the tree is in fruit or otherwise. The lime-sulphur may be used in the spring sprayings against the fungi as against the insects. Bordeaux or lime-sulphur may be applied in the fall, according to the preference of the grower.

The following insects are believed to be present in the valley, but further records are necessary before further reference is made: The raspberry-cane borer; the raspberry-root borer; gooseberry-borer; several blossom-beetles; *Teras minuta;* apple-buccalatrix; *Archips argyospila;* apple-scolytids; apple-sawfly; flat-headed apple-borers; round-headed apple-borers; apple-leaf miner; *Aspidiotus ostræformis; Pulvinaria innumerabilis; Chionaspis furfura;* red spider; clover-mite; *Vanessa antiopa; Plodia interpunctella,* with several others of lesser importance.

BEE-DISEASES IN BRITISH COLUMBIA.

BY F. DUNDAS TODD, APIARY INSPECTOR, LOWER FRASER VALLEY.

Once upon a time, it is said, a learned gentleman was called upon to prepare a paper for a natural history society upon the subject of "Snakes in Ireland." He disposed of the whole matter in one sentence, "There are no snakes in Ireland."

While not posing as a learned gentleman, I have been asked to write for this Society a brief paper on "Bee-diseases in British Columbia," with the solemn warning from the Secretary that I must limit my verbosity to the reasonable duration of fifteen minutes. But in one respect I can emulate the brevity of the learned gentleman who was posted on snakes, and say: "So far as I know, there are no serious bee-diseases in British Columbia." Understand, please, that we are not without worries, for if the chiefs of our Agricultural Department had not luckily inaugurated hive-inspection at a most opportune moment, we in British Columbia would to-day be probably fighting a rearguard action against a most insidious foe. Three times in three years foul-brood, the most deadly of all bee-diseases, has broken out in the Province, but thanks to the all-pervading system of apiary-inspection in force, each outbreak has been discovered and so terminated before it had a chance to spread from the centre of infection. British Columbia, so far as I know, is the only part of the world where systematic inspection of every hive is the rule, and the results of the past three years demonstrate the wisdom of the procedure.

The first discovered case of foul-brood was introduced from Ontario by a settler. The second case as the result of the bringing-in of a colony of bees from England by a rancher, who had a warm spot in his heart for the kind of bees he had handled in the Home-land. The third case was found in an apiary that had been imported from Oregon. The most noticeable feature of the last case lies in the fact that the germs apparently lay dormant for three years at least, for the disease did not develop until the hives had been in their new location for that period of time.

There is a report of a possible fourth case. One bee-keeper reported to me that several of his colonies had been affected and that he had traced the infection to an empty honey-can that had been thrown outside by a neighbour. The honey came from Ontario, a Province where foul-brood is so widespread that sixteen Inspectors are unable to make headway against its ravages. The bee-keeper at once destroyed all infected combs and apparently eliminated the disease, but with the delayed development that happened in the Oregon case before us, you may be sure this particular apiary will be closely watched in 1914.

Outside of foul-brood, there are many minor bee-diseases which have been loosely classified as "pickle-brood." In 1912 there were hundreds of cases of pickle-brood in the district of the Lower Fraser Valley, so many that I had considerable anxiety; so about half a dozen samples were submitted to the Bacteriological Department at Washington, D.C., where special investigations on the causes of the bee-diseases have been conducted for many years. It is comforting to know that in every instance they reported that the ailment was not of a serious nature.

The trouble reappeared in 1913, but in a very mild form, and in greatly diminished number of cases. By the end of 1912 I had come to the opinion that the very variable weather of the spring and summer was the cause of the trouble.

During the "building-up" season, when nectar is coming in, the unsealed honey is naturally first fed to the larvæ. Should this become exhausted, then the sealed stores are brought into requisition. Given a week of warm weather in spring with a free flow of nectar, the colony will expand the brood-nest and induce the queen to lay freely. Then let a few days' rain occur, with a consequent stoppage of nectar, the natural result is that the unsealed honey is all used up and the bees must uncap the old stores.

This takes time, but the work of the hive has been organized on the basis of easily reached food-supply. As a consequence, many larvæ are sealed up for the pupation period with insufficient food-supply, and consequently die of starvation. This particular form of pickle-brood is really starved brood, and therefore not infectious. Until I came to grasp the real facts of the situation there was naturally an anxious time for me.

By deciding to quarantine all imported bees at the point of entry, the Province has practically eliminated the possibility of introducing foul-brood along with settlers' effects, but unfortunately we are unable to completely attain immunity.

We are very seriously threatened all along the International Boundary-line, for in many parts of the State of Washington, to the south, foul-brood is rampant, especially in the Seattle and Tacoma districts. Every dead cedar-tree is a possible home for a swarm, and so we must look forward to the time, and that not very far distant, when the trouble will reach British Columbia by the dead cedar route. I have seen at least a hundred bee trees in my territory, so I am led to expect that there are more wild bee colonies than those under control in the valley of the Lower Fraser. Since man has but little influence over bees in trees, a long wearisome fight will have to be waged while the increasing population is clearing the land.

The danger from infested honey is ever imminent, for every jar of imported honey is a possible menace. I am in hopes that in a few years this particular form will be materially lessened, as the Bee Inspectors, in giving instruction in apiculture, have materially brought about an increase in the honey-production. It is now evident that there is in existence at the present time in British Columbia sufficient hives of bees to produce as much honey as we import, provided all of them are as intelligently managed as are the most efficient. There has been a widespread opinion among bee-keepers that our Province was not a good honey country, but the Inspectors have been able to devise methods for each locality, so that the more enterprising men have got enough of a honey-crop to encourage them to put more time into the study of apiculture, feeling that the monetary returns will more than justify the effort.

After all has been said and done, the most efficient corps of Foul-brood Inspectors will ultimately consist of efficient and successful bee-keepers. To produce these is the chief aim of the Bee Inspectors of the Province of British Columbia at the present time.

The President: You have heard this very interesting paper by Mr. Todd. It is to be regretted that he was unable to be present with us to-day to say these things in person. However, if there are any present who would like to say a few words on the subject, I am sure we would be glad to hear them.

Mr. Treherne: It is unfortunate Mr. Todd, in his paper, has not been more definite in his reports of the foul-brood cases. I presume he refers to the Lower Fraser Valley alone.

Mr. Robinson: I am sorry Mr. Todd is not present also, as I would like to ask some questions.

Mr. Day: I notice Mr. Todd was a little indefinite in reporting the occurrence of foul-brood in the Province. Are there any specific cases determined and reported in British Columbia?

Mr. Robinson: For myself, I do not know whether any exist or not. Two supposed cases occurred at Vernon last year. Our official reports on the subject are too vague for correct diagnosis.

Mr. Treherne: To what extent does American foul-brood occur in the State of Washington?

Mr. Robinson: I have no records with me, but I fancy there is quite a good deal of it.

Mr. Day: And it can be carried by bees in flight?

Mr. Robinson: Certainly.

Mr. Treherne: How close is it to the border?

Mr. Robinson: We do not know. I would like to say, in discussion on Mr. Todd's paper, that in my opinion the present quarantine regulations which force bees to be held for ninety days at the border is not only not humane, but not an efficient safeguard to the Province. The bees will die from worry or from starvation, and the danger of an infected colony confined at the border is no guarantee that the disease is held in bounds. For a complete safeguard I would like to see a complete and efficient quarantine against all imported bees and bee products of the hive. Honey is one of the prime causes of infection and distribution of foul-brood, and the

case mentioned in Mr. Todd's paper, in his Oregon case where the disease, if it proved to be, held over for three years, is quite possible. Empty honey-tins of imported honey may also spread the disease.

(A long and interesting discussion on the above lines proceeded for some time, in which all the members joined. In the evening session the discussion again began regarding the possibility of introducing foul-brood, with the result that a resolution was moved and passed relating to the issue. This resolution will be seen on page 74.)

Mr. Taylor: While we are on the subject of bee-diseases, I would like to bring up the question of the possibility of the germs of fire-blight (*Bacillus amylovorus*) "carrying over" in hives during winter. I may say that at a recent meeting at Kelowna a discussion on the above subject was begun and it caused quite a stir. The growers thought that the disease was spread from the hives to the trees in the spring, and if this was so it meant another way of combating the disease which during the last year has been very destructive to our orchards in the Okanagan. I told the meeting in Kelowna that I would bring the matter to the attention of the entomologists in session in January to determine what was known in the matter. Can any one offer any suggestions?

Mr. Lyne: I would like to remark that there is an excuse for the growers in their supposition that there is a possibility of carrying over the disease in wax or honey in bee-hives. It is well known, of course, that the bees are the active agents in the spring for spreading blossom-infection; consequently it may be so as they suggest. I am not prepared to say. The question may prove to me a scientific problem which may be of use.

Mr. Taylor: I may say that I asked Mr. Brittain when he was with us in the Okanagan, and the question was new to him. I placed my bees at his disposal, but he had no time. At any time I should be glad to place my bees at the disposal of any who would care to work out the problem.

Mr. Robinson: I have no data on this point, neither have I heard the question asked before. I can offer no suggestions on the point beyond the fact that, if this disease you mention can be carried over in bee-hives during winter, the same treatment as D. A. Jones some thirty years ago applied to foul-brood colonies may be applicable. In this case germs are carried over and all attempts at disinfection were useless. The starvation cure, however, proved successful. This consisted of shaking the bees into new hives and starving them. When some dropped it was supposed the germs or spores of the disease were killed. The bees were then returned to their quarters.

Mr. Taylor: In view of the disconnected knowledge on this point I believe some kind of investigation would be in place. I will therefore place the following resolution before you. (This resolution will be found on page 73.)

Mr. Day: We will now adjourn for lunch, meeting here at 2 p.m. this afternoon.

THE TENT-CATERPILLAR.

By Tom Wilson.

The species of tent-caterpillar that we have with us in the Lower Fraser Valley is probably that known as *Malacosoma erosa*, which we are informed is only a variety species from *M. disstria*. Its appearance in the valley is periodical. It is subject to years of ups and downs in the matter of prevalence. The same occurs with a great many insects, and this periodical occurrence of insect-life, in abnormal numbers or otherwise, is, of course, influenced by natural causes, climate, fungus, bacterial diseases, or insect parasites being the main causes.

The study of the real and actual causes under strictly local conditions and relative to this species of tent-caterpillar has not up till now been proceeded with, and I do not propose dealing with these issues in this paper. Suffice it to say that the tent-caterpillar, a familiar insect to all of the farmers in the valley, varies in

its centres of infestation one year following another. One year it will be very troublesome on the Delta, and another year at Agassiz, and so on. It is therefore with the purpose of detailing the centres of infestation, such as I have notes on, each succeeding year, to demonstrate the trend and the migrations of these insects, that is the main reason for this paper.

In 1896 the caterpillars were very prevalent in the Lower Fraser Valley from Agassiz down to the mouth of the Fraser Valley; that is, the entire valley was severely troubled by the presence of these insects.

In 1897 the caterpillars were again present throughout the valley, with a slight increase in numbers in the Chilliwack District and a lessening or easing off through the Delta.

In 1898 Chilliwack, Langley, and Surrey were the centres of infestation, while there was a lessening in abundance on the north shore of the Fraser and a practical disappearance on the immediate coast.

In 1899 only a few caterpillars were observed in the valley this year, which indicated that some disease coupled with its own insect parasites had been active during the fall of 1898. This remarkable disappearance of the insect in injurious numbers is worthy of note, for this condition of almost freedom continued until 1907, a period of nearly ten years. I do not wish to advance any theories on these happenings, as they are beyond my ken, but I merely wish to record the dates and the years when these caterpillars were troublesome to the farmer. The points or centres of infestation already mentioned were severe infestations, the caterpillars causing serious injury to the foliage of orchard as well as to ornamental or forest trees.

In 1908 the caterpillars appeared again during the summer, evidently from eggs laid the previous fall. They evidently had come up from the State of Washington from the south, as they were very destructive from the International Boundary-line through the Delta, Surrey, and Langley Districts. They appeared in slight numbers in the Chilliwack and Agassiz Districts and only lightly on the north shore of the Fraser. This 1908 infestation was severe and covered a great deal of territory, and when it is considered that in the year previous (1907) there was a practical freedom, with the exception of a slight infestation somewhat heavier than elsewhere in that year about Maple Ridge on the north shore of the river and at Langley on the south, it seems the more remarkable.

In 1909 the infestation had increased to a great extent, about the same territory as in 1908 being still the worst infested. It may be practically said that the infestation was doubled at each point as compared with the year previous.

In 1910 the moths had evidently flown up the river towards Lytton, for during this summer a few caterpillars were observed at this point. Hope, Ruby Creek, Agassiz, Chilliwack, Harrison River, and Dewdney were evidently the centres of infestation, while there was also a continuance, but possibly to a lesser degree, in the Langley, Surrey, and Boundary Districts. It was apparent the infestation was moving eastward.

In 1911 only a few caterpillars remained at Chilliwack and Surrey. I have no notes on the country east up the river, but judging from the migration route it would appear possible that the Lytton District was the centre of infestation.

In 1912 only a few remained up the river, while the Fraser Valley was fairly free.

In 1913 there were no caterpillars in the Lower Fraser Valley, but the country about the Pemberton Meadows and as far up the Fraser River Valley as Quesnel were very severely infested. An account of this infestation I have included in another part of this bulletin under the heading of "Insects for the Year."

This present winter (1914) I have been on the search for egg-masses, but I have been forced to consider that we are not likely to be again visited by the caterpillars this coming season. If there is such a thing as recurring seasons, and any definite rule on which Mother Nature works, it may be possible that we will not again be troubled by a serious outbreak, such as the ones I have mentioned, for possibly ten

years. It will be very interesting to see when and from where the next infestation comes, but in the meantime I will not dare to set my brains to work to offer suggestions as to the controlling influences in the universe, to predict when the next outbreak occurs.

So far as Vancouver Island is concerned, my notes extend back only as far as 1908, in which year the caterpillars were very numerous and destructive in the neighbourhood of Victoria and up the line of the Esquimalt and Nanaimo Railway to all points where there was a preponderance of crab-apple trees.

In 1909 it was again very prevalent about the same points and through as far as Alberni.

In 1910 there was a distinct lessening of the attack at all the above points on the Island. I have notes to show that a great deal of parasitism took place this summer, which must have been very effective, for in 1911 they had practically disappeared, and thus far have not appeared again.

Here again, as on the Mainland, it is gratifying to note the scarcity of egg-masses in most of the districts which have been subject to the heaviest attacks in the past, both in orchard and forest.

PRELIMINARY NOTE ON THE WORK OF ERIOPHYES SP. UPON APPLES, APRICOTS, AND PLUMS.

By W. H. Brittain, B.S.A., Provincial Entomologist.

The first specimen of the work of this mite to come under my notice on some young apples was sent in by Mr. Chas. Holt, of Balfour, B.C., on July 3rd, 1912. Since that time I have had samples sent in from all parts of the Kootenay and Okanagan Districts. The correspondent nearly invariably stated that the trouble attacked the same trees year after year and did not seem to spread rapidly through the orchard. Nearly always it was confined to a few varieties—Wealthy, Duchess, and Yellow Transparent.

Affected fruit has a peculiar spotted or blotched appearance. The injury varies from slight elevations or blisters upon the skin, of about 1 m.m. diameter, to large, slightly raised blotches, which may involve one-quarter to three-quarters of the surface of the fruit, the cells below the surface being also affected to some extent. The raised patches vary considerably in colour, some appearing dark green or water-soaked; others dark red or reddish-brown; and others, again, a dark yellowish-brown. The smaller blisters are in most cases red or reddish. In some cases the blotches are not raised at all.

Where the injury is very severe the fruit may be dwarfed or stunted. The death of the cells and underlying tissues sometimes results in the formation of brown sunken spots or even cracks upon the fruit. The fruit may reach its normal size, but more often it drops prematurely.

Where the mites are active a clear, slightly yellowish fluid will sometimes be detected oozing through the skin. Later the fluid may become cloudy, or whitish in colour. On examining this exudate and the tissue beneath, the adults and eggs of the mites were found in abundance. The exudate was first noticed on July 10th; and hundreds of samples of such fruit were examined at intervals throughout the season, the mites being present in each instance.

On August 15th a number of apricots were sent in from Naramata, covered with reddish and brownish-yellow unraised blotches. Examination revealed the presence of the mites and their eggs. Similar specimens obtained from different parts of the Okanagan, obtained at the packing-house of the Vernon Fruit Union, showed the apricots to be affected by the mites.

On August 19th Mr. Wm. Middleton, Jr., sent in a box of plums from Penticton. These plums were covered with raised russet spots and beads of a clear fluid. From these specimens were also obtained mites and their eggs.

An attempt was made to transfer the mites from diseased to healthy fruit. Though negative results were obtained in most cases, the typical mite-blisters were produced in a few instances and the mites again recovered from the inoculated fruit. From this it would seem that these mites are probably responsible for the foregoing symptoms on apples, apricots, and plums.

From inquiries which we have received, and from notes taken regarding the distribution and destructiveness of the "apple-blotch mite," there seems to be no doubt that this pest is one to be reckoned with by fruit-growers in all parts of the Province.

A number of correspondents claim to have exhausted every means of control without effect. A careful study should undoubtedly be made of the life-history of the mite, and experiments conducted with a view of obtaining some satisfactory method of control.

ANTS AS FRUIT-TREE PESTS.

BY W. H. BRITTAIN, B.S.A., PROVINCIAL ENTOMOLOGIST.

I first noticed the work of these ants, which were determined by Dr. Wheeler as *Formica rufa*, Linn., subs. *obscuripes*, upon peach-blossoms at Penticton on May 3rd, 1912. The ants were boring into the nectaries of the blossoms, destroying the pistil and feeding upon the nectar. In some cases small round holes were eaten in the petals, and in a few instances the young tender foliage was injured in a similar manner.

In an orchard at Summerland on May 10th, 1913, I noticed a Morello cherry-tree in which 75 per cent. of the blossoms were destroyed by these ants, which swarmed over the tree and ate out the pistil of the flower to get at the nectar.

At Kelowna on May 12th, 1912, Mr. Lionel Taylor, of the Bankhead Orchards, called my attention to apple-blossoms injured in the same manner as above.

In no case where I have seen this injury has there been any aphides present on the trees. It is conceivable that herein lies the explanation for this strange behaviour of the ants. In a German paper (Vosseler J. Verhinderung des Fruchtansatzes bei Cobœa durch Ameisen, Zeitschr. Wiss. Insectenbiol. 11, 1906, pp. 204-206) mention is made of an ant boring into the blossoms of *Cobœa scandens* to get at the nectar.

Though this species is an abundant one everywhere in the North-west, little seems to be known of its habits and life-history. I have only one note on the habits of the species, taken at Vernon on June 15th, 1913. A large number of the ants were swarming around the base of the apple-tree, busily engaged in destroying and carrying off the cutworms which were abundant in the soil of the orchard. Though the insect is a very small one, it seemed capable of handling a cutworm considerably larger than itself.

PRESIDENT'S ADDRESS.

(G. O. DAY, F.E.S.)

Gentlemen,—When I was casting about in my mind for a subject for an address this evening, it appeared to me that a review of the study of entomology in the Province would be suitable and useful and perhaps acceptable to our members, especially to those who have joined our Society in recent years. On mentioning the matter to our Secretary, Mr. Treherne, I found that he had already written a paper covering much the same ground that I had intended to deal with, and supplementing the information contained in Mr. Tom Wilson's address in 1911.

I urged Mr. Treherne to read the paper himself, and I would content myself with a few general remarks on other matters. However, with great generosity he placed the results of his labours at my disposal. So you must please understand that the following is a joint production. I feel extremely reluctant to appropriate another man's work for my address to-day, but as Mr. Treherne was down on the programme to read another paper, and also because I am confident that the notes he has gathered

together will form an interesting record for future reference. I have put my hesitation at using them on one side.

All records point to one man, the late Rev. George W. Taylor, F.R.S.C., F.Z.S., as the first active entomologist in this Province. He settled on Vancouver Island in about the year 1877 and studied for the ministry. In 1881 he was made a Fellow of the Royal Society of Canada, obtaining this honour largely through his interest in entomology. During the next few years Mr. Taylor proved himself an active collector and a keen student in the order. At the annual meeting of the Entomological Society of Ontario, held in London, Ontario, October 15th, 1884, he presented the Society with a collection of Diurnal Lepidoptera through the medium of Mr. James Fletcher.

In 1885 a record is found on the "Entomology of Vancouver Island; Notes on Seventy-six Species of Cicindelidæ and Carabidæ collected near Victoria, Vancouver Island," by George W. Taylor, Victoria, B.C. In the remarks on this paper, Mr. Taylor says: "The beetles enumerated were all taken by myself in the neighbourhood of Victoria during the past few seasons. . . . A large number (40) of those I now record are new to the Canadian fauna, that is as far as my knowledge of the same goes, and some of these additions are very interesting ones." Mr. Taylor adds further in the same paper: "I have added to the list two species taken on the Mainland of British Columbia by Mr. James Fletcher (of Ottawa) in 1883 and very generously given to me."

A demand for entomological knowledge was evidently beginning to be felt within the Province at this time, for in 1887 Mr. Taylor was appointed Honorary Provincial Entomologist for British Columbia.

The next evidence of activity is in 1893, when in a bulletin of the Natural History Society of British Columbia, which was printed under the auspices of the Government, we find a "Report on the Entomology of British Columbia," prepared by Messrs. W. H. Danby and C. De Blois Green. In the text of this report we receive light on the status of entomology at the time. A "Preliminary Check List of Lepidoptera collected in British Columbia" is included therein. This list contains the names of ninety species of Diurnals and seventy-one species of Heterocera, all, with the exception of one species of butterfly, given on the authority of the two authors, Messrs. Danby and Green. There is also included a plate illustrating seven new species, viz., *Eumelia dānbyi*, *Xylomiges candida*, *Rancora strigata*, *Pleroma apposita*, *Xylomiges putchella*, *Xylomiges cognata*, and *Taeniocampa ferrigera*.

Working Lepidopterists here this evening will form a judgment from this list of species recorded as new in 1893 how little collecting had been done before that date, for, with the exception of the last two of the species mentioned, the rest are now known to be more or less common. The list does not include any of the Geometridæ nor any of the Microlepidoptera. In explanation of the omission, the following note is recorded: "The names of species belonging to the Geometrina cannot be included in this report, for the reason that to get them named by competent authorities takes considerable time, in consequence of the great care necessary to avoid mistakes." The report further states: "No great work was done (in 1892) in collecting Coleoptera, with perhaps the exception of capturing that rare beetle *Ulochætes leoninus*, which is one of the few short-winged species of this family in our fauna, a single specimen being taken at Alert Bay, and a few other rare species being collected in Victoria, names of which have yet to be recorded. Many Diptera were collected, names unknown, with the exception of *Anisopogon ludius*, n. sp. nam. ed., by Mr. D. W. Coquillet, Los Angeles, Cal., which was captured at Goldstream on Mount Austen. Amongst the Arachnida very little was achieved, the species taken being collected more for friends than for study. However, a few specimens were kindly named by Dr. Nathan Banks, of Washington, D.C., amongst them being new species of *Pardora* and *Coriaractine*, also a variety of *Epeira insularis*, Hentz."

No entomological work of importance seems to have been done in the Province between the date of this bulletin (1893) and 1901, the year in which the British

Columbia Entomological Society was inaugurated. Before dealing with the formation of the Society, it would perhaps be well to touch upon the literature applying to the insects of the Province available to students prior to 1901, and also noticing some of the works published since.

At that time it is doubtful if local collectors had access to any illustrated books of any great use to them on any orders other than Lepidoptera. Most of the material had to be sent away to specialists for identification and naming. I may remark, in passing, that this necessity still exists, unfortunately, though to a lesser extent. Comstock's "Manual for the Study of Insects" was published in 1895. But this book, excellent though it is, so far as it goes, comprises all the orders of insects, and of necessity cannot treat the separate orders more than in a brief manner within the space of a single volume.

When our branch of the Entomological Society of Ontario was formed, the Smithsonian Institute of Washington, D.C., presented it with a number of works relating respectively to most of the orders of insects. A list of these books is given in the British Columbia Entomological Society's Bulletin No. 5, and the works are still in our library.

British Columbia collectors laboured under a further disadvantage, because most of these publications related to United States insects, and it was only in cases where the same insects occurred in both countries that our entomologists could obtain from books the information they wanted.

On Lepidoptera the most generally accepted work was the "List of the Lepidoptera of Boreal America," by John B. Smith, Sc.D., and others,, published in 1891. This list was merely a list, and, moreover, did not contain a good many of the British Columbia species, but it was the only foundation students had to work upon at that time. It is therefore little wonder that the study made slow progress. A more ambitious and more comprehensive work on the same lines was published by the Smithsonian Institution, Washington, in 1902. The title of this is "A List of North American Lepidoptera and Key to the Literature of this Order of Insects," by Harrison G. Dyar, Ph.D. This catalogue, which found greater favour than Smith's, was in general use in the Province in 1903, and without doubt gave a great impetus to the systematic recording of moths and butterflies by our local entomologists.

Other works which were, and still are, of great service to collectors in British Columbia are Mr. W. J. Holland's "Butterfly Book," published in 1898, and the same author's "Moth Book," published in 1903. These two volumes contain coloured illustrations of most of the better-known species of Lepidoptera found in America north of the Rio Grande of Texas, and include many British Columbia insects. The price of these two books is within the reach of most of us. A more expensive work on the butterflies had previously been published, for in a preface to his "Butterfly Book" Mr. Holland states: "A few years ago the preparation of such a work as this at the low price at which it is sold would have been an utter impossibility. 'The Butterflies of North America,' by W. H. Edwards, published in three volumes, is sold at $150, and, as I know, is sold even at this price, below the cost of manufacture."

Another book useful to British Columbia collectors, but covering much the same ground as Holland's, is W. G. Wright's "Butterflies of the West Coast of the United States," published in 1905.

In 1904 Mr. August Busck, of the United States Department of Agriculture, published an account of the "Tineid Moths from British Columbia, with Descriptions of New Species." In the preface to this work the author honours, among others, Messrs. J. W. Cockle, of Kaslo, B.C., and Theodore Bryant, of Wellington, B.C., for assistance rendered in the work.

In 1904 Dr. Harrison G. Dyar again publishes a valuable work on the "Lepidoptera of the Kootenai District of British Columbia." In this work again the experience of Mr. J. W. Cockle is often referred to.

In 1904, again, largely resultant from the impetus given the science of entomology in the Province by Dr. Dyar's "List of Lepidoptera," and founded directly on that list, Mr. Francis Kermode, Curator of the Provincial Museum, Victoria, assisted by Mr. E. M. Anderson, also of the Museum, published a "Catalogue of British Columbia Lepidoptera" from cabinet specimens in the Museum.

This list was revised and enlarged in 1906 by the officers and other members of the British Columbia Entomological Society, and published by the authority of the Legislative Assembly from the Provincial Department of Agriculture.

I will now go back to the point where I broke off to speak about the literature available to students in the Province.

In 1901 we read of the formation of the British Columbia Entomological Society, of which the Rev. George W. Taylor naturally became the first President. The following account records the initi[illegible]ception proceedings, and the subsequent occurrences relative to the Society, in the words of Mr. Tom Wilson when Vice-President in 1911: "In 1901 the late Dr. Fletcher had occasion to visit British Columbia in connection with the work of his Department. During his stay in Vancouver I had the opportunity of introducing him to Mr. R. V. Harvey, of the city, who was then Principal of Queen's School. In discussing matters in connection with the entomological work in British Columbia, the idea was suggested to form a Society whose special object was to unify the work of those particularly interested in the study of insects in the Province. The idea came to maturity and the Society was formed. For two years we had a live Society here in Vancouver, with such members as Messrs. G. W. Taylor, Sherman, Bush, Dashwood-Jones, Ed. Wilson, Draper, Marrion, Bryant, L. D. Taylor, Hanham, and myself in more or less regular attendance. . . . Regular meetings were held in Vancouver and reports were issued semi-monthly on matters of interest. These reports took the form of letters which were forwarded from one member to the other by the members themselves."

The first meeting of this Society was called on March 13th, 1902, in Queen's School, Vancouver. Biannual meetings appear to have been held from this date until February 6th, 1905. The records of such meetings are preserved in a minute-book, no attempt being made to print them for permanent distribution and record.

Great credit is due R. V. Harvey, M.A., for his earnest endeavours in maintaining and recording the minutes and transactions of the Society. These same are being retained on the shelves of the Society to-day, and as they contain many notices of important captures and worthy resolutions, they will long be referred to by students in entomology. In fact, next to the late Rev. G. W. Taylor, I think we are mostly indebted to Mr. Harvey for the continuance of the Society as a Society from the commencement in 1901 until 1908, during which period he acted as Secretary, for when he gave up active interest in entomology, principally, no doubt, on account of increased professional responsibilities, not only were the bulletins (to be mentioned) dropped, but the meetings of the members ceased temporarily.

This is not to be wondered at when it is remembered that most of the articles appearing in the bulletins were from Mr. Harvey's pen. The bulletins contain much interesting reading and I cordially recommend them to your attention. Copies are to be found in the library of the Society.

The first quarterly bulletin was published in March, 1906. In the opening paragraphs we find the following words: "Ever since our Society was formed we have laboured under a difficulty which has severely handicapped our work—namely, the distance which separates individual members. . . . Attempts have been made to meet this difficulty by sending round MS. notes, but here the neglect of one member has thrown the whole system out of gear. . . . Last December the Secretary approached the Provincial Department of Agriculture to obtain aid in printing a regular bulletin of our proceedings and work. This assistance has been promised for one year, and it rests with us to prove to the Department the value of our work. The bulletin will be published in March, June, September, and December, and a copy will be sent to each member."

These bulletins contain reports of annual meetings, articles on breeding, collecting, etc.; on the "Distribution of Insects in British Columbia"; on the "Captures and Lists of British Columbia Insects"; besides much other readable matter. It is refreshing to see that it is not only the order Lepidoptera that is dealt with, but that there is much information on other orders, especially Diptera and Coleoptera. The whole series of notes contained in these pamphlets represent good basal work for students in the Province for the future.

The bulletins, ten in number, continued to be issued until June, 1908, when, in the final number, the last record of an annual meeting of the Society, which took place at Duncan at the residence of Mr. G. O. Day on Thursday, April 16th, 1908, is found.

Thus for so long—from March 13th, 1902, until April 16th, 1908—the Society was active and strong, but after this date no further regular meetings appear to have been held, until the Society was resuscitated later, on December 9th, 1911. In the words of Mr. Tom Wilson, Vice-President of the Society: "Interest gradually waned—not, let it be understood, in entomological work, but rather as a Society."

On March 29th, 1905, a circular letter was sent out by the Secretary, Mr. Harvey, duly authorized by the Society, stating that the British Columbia Entomological Society had been duly affiliated as a branch of the Entomological Society of Ontario, and that the subscriptions of members, $1 per annum, would cover all the privileges attaching to both Societies—namely, the receipt of the *Canadian Entomologist* monthly and the monthly list of records circulated among the local members. This arrangement has been carried out ever since that date, with the exception that the monthly list of records ceased.

In addition to the literature already mentioned and the lists, notes, etc., in the quarterly bulletins, the *Canadian Entomologist*, issued monthly, contains from time to time many notes and records for the Province of British Columbia.

I will not deal with the review of the economic phase of the subject, as I am leaving this to Mr. Treherne, but before closing I would like to say a few words to bring the history of the Society up to date.

It is no doubt in the recollection of all of you that it is entirely owing to the energy and enterprise of Mr. Treherne that the Society has been made active again. He called a meeting in December, 1911, at Aberdeen School, Vancouver, at which seventeen regular members were in attendance and various papers read.

The next meeting did not take place until January, 1913. This was held in the Botanical Room, Parliament Buildings, Victoria, kindly placed at our use by courtesy of the Minister of Agriculture, and the attendance of members was very satisfactory.

A new departure was made by a proposal to hold a special summer meeting at Vernon, B.C. The meeting was duly held on July 18th and 19th, when between fifty and sixty persons were present at the various sessions. The papers read were, by a generally accepted arrangement, chiefly devoted to such subjects as injurious insects and spraying. The meeting proved most successful, the papers presented being instructive and valuable contributions to the science of economic entomology in connection with fruit-growing.

Owing to the liberality of the Minister of Agriculture, the Honourable Price Ellison, the Society has been enabled to print and publish full reports of all the papers given, and by the energy of our Secretary copies have been widely distributed throughout Canada.

Looking back upon the work of the past year, I think we have every reason to feel satisfied at the activities and progress of our Society, and be greatly encouraged to look forward to further usefulness and a continuance of interest in our particular study.

Speaking for myself, I would like to say that I have felt much honoured in holding the office of President for the past year. Besides being an honour, it has

been a great pleasure to me to help forward the subject of entomology in the Province, and incidentally to meet so many men interested in the realm of insects injurious or otherwise.

On completing my year of office as President, I wish to thank you most cordially for your attendance and support and for all the time you have devoted to the study of entomology.

May I be permitted to express the hope that your interest will not be allowed to wane, and that our Society may continue to show its vitality by giving evidence of good work accomplished, and may further justify its existence by fostering a feeling of mutual help, encouragement, and incentive among the members, and that as individuals we may each derive benefit from our association and co-operation as a body.

Before I sit down, there is another matter I wish to mention, and that is the aid and recognition the Society has received and is receiving from the Government through the Department of Agriculture, of which the Honourable Mr. Ellison is the head. I, for one, fully realize the importance and value of the support given, and I think it is our bounden duty to pass a formal resolution at this meeting, which can be done in its proper place later in the session, expressing our thanks and appreciation of the assistance rendered by grant of money and by the printing of our Report, and, not least, of the encouragement and personal interest in the Society by the Honourable Mr. Ellison himself.

NOTES ON SOME OF THE VARIABLE SPECIES OF THE GENUS HYDRIOMENA AND ITS ALLIES OCCURRING ON VANCOUVER ISLAND.

BY E. H. BLACKMORE, VICTORIA.

As I have been giving special attention to the genus *Hydriomena* and its allies during the past season, and in addition have had my material determined by a well-known specialist, I thought that a short note on a few species and varieties of this group would be of some use to the science of entomology in the Province. This winter while classifying and rearranging the species belonging to the *Hydriomena*, collected during the past season, I was struck by the remarkable variations occurring in some of the species, and in some instances the constancy of the variations was particularly noticeable. As many of these forms were new to me, I compared them with several local collections, and was surprised to find them listed under one or the other of two names. However, I was convinced that they were different species, or at least good varieties. I separated them into as many series as their variations would allow and submitted the whole to L. W. Swett, of Boston, Mass. He has been to a great deal of trouble to get some of them determined, necessitating several trips for comparison with large collections in the New York and Cambridge Museums, and I am greatly indebted to him for his determinations and also for a great deal of information given me in his replies.

The first species I wish to take up is the one listed as *Mesoleuca truncata*, Hufnagel, in Dyar's List No. 3379. In the catalogue of British Columbia Lepidoptera issued in 1904 it is listed under that name, with the words "very variable" after it, and in the Check List of British Columbia Lepidoptera, published two years later, *Mesoleuca immanata* is listed in addition to *truncata*, which is No. 3380 in Dyar's List. Now, *M. truncata* and *M. immanata* were very badly mixed up until Mr. L. B. Prout, of England, worked them out, giving the synonymy and varieties in the "Transactions of the City of London Entomological Society" in 1908. He showed that *truncata* is strictly European, and though closely allied to our form here is not the same. The form we get in North America is *citrata*, Linn., and described by him in 1761 from a specimen taken in Scandinavia, and is quite different from *truncata*. The chief difference lies in the extra diskal band beneath the hind-wing; in *truncata* it is rounded all the way, whereas in *citrata* it ends in a sharp angle as it reaches the base. On the primaries above, the projections in *truncata* are more

rounded and less toothed than in *citrata*. Mr. L. B. Prout has resurrected the genus *Dysstroma*, which was a synonym of *Hydriomena*, and in it he has placed *truncata*, *citrata*, and their varieties, making *truncata* the type. Speaking of varieties, in Europe alone *truncata* has seven and *citrata* thirteen named varieties, which, in addition to five or six varieties of the latter which occur in North America, makes it no easy matter to separate them. *Dysstroma citrata*, Linn., occurs in the eastern portion of this country and does not occur in the West at all, although we have four of its varieties occurring on Vancouver Island—viz., *immanata*, Haw.; *suspectata*, Mosch.; *mulleolata*, Hubst.; and *junctum-notata*, Haw.

I will now try and describe the differences between these varieties as briefly as possible. (I have with me specimens of typical insects and the varieties, and also, through the kindness of Mr. Swett, a specimen of the Eastern *citrata* and one of the European *truncata*.)

The normal *citrata* is grey, with a solid grey central band and no red or brown markings whatever. The variety *immanata* has the median band black instead of grey, and the rest of the primaries brownish. *Junctum-notata* has the central portion of the mesial band white, and in general appearance is very much like the true *truncata*, but can always be told by the differences in the extra diskal band beneath the hind-wing. The variety *suspectata* has no white in the mesial band, is orange-red towards the apex of the fore-wing, and has the median band more toothed, and in the upper part of the same band has a slight projection which does not occur in the other varieties. The fourth and last species, *mulleolata*, which Dyar lists as a synonym of *truncata*, is much larger than the other varieties; the hind-wings are darker and the projections on the median band are more rounded.

In summing up the above changes and additions, we will have to drop the names of *Mesoleuca truncata* and *immanata* from our British Columbia lists and add the following, which is how this species stands at present:—

Dysstroma, Linn., var. *immanata*, Haw.
" " *suspectata*, Mosch.
" " *mulleolata*, Hubst.
" " *junctum-notata*, Haw.

Before leaving the genus I would like to remark that in all our local collections I have seen *Mesoleuca vasiliata*, Gue., var. *nineifascia*, Hubst., is listed wrongly as *Mesoleuca vasiliata*, Gue. The variety has a white band which is entirely lacking in the typical *vasiliata*. Of course, the true *vasiliata* may occur here, but all the specimens I have seen so far are the variety *nineifascia*.

Coming to our genus *Hydriomena*, we find another name has to be dropped from our list, and that is *tæniata*. Now, *Hydriomena tæniata*, Stephens, is a strictly European species and does not occur in North America; the form which takes its place in the East is *basaliata*, Walker, which Dyar lists as a synonym of *tæniata*. It is not a synonym, but a good species.

We have another form here on the Pacific Coast called *grandis*, which Dyar erroneously placed in the genus *Eucymatoge*, Hub., but there is no doubt that *grandis* is the Western form of *basaliata*, the median band being a little different in outline and there are other minor differences. I have also taken a variety of *grandis* both in Victoria and at Duncan, V.I., which is a little different in markings, being of a warm brown colour. This species is as yet undescribed, but it will probably be described some time this year. Both *basaliata*, Walker, and *grandis*, Hubst., along with a few others are being taken out of the genus *Hydriomena* and placed in the old European genus *Larentia*, thus reserving *Hydriomena* for the true forms, such as *californiata*, *autumnalis*, *furcata*, etc. Our species therefore will stand as *Larentia grandis*, Hubst.

The next species on my list is *Hydriomena californiata*, Packard, which is our commonest and at the same time the most variable species of this genus that occurs on Vancouver Island. I have seen three and in one instance four different species listed under this one name. As far as is known, it only occurs on the Pacific Coast

and is the Western representative of *H. autumnalis*, Strom., differing from this latter species in having red shadings to lines and mesial space. Strange to say that, although *californiata* has no described varieties of the Eastern form occurring here, there is one which is generally listed under the name of *Hydriomena autumnalis*, Strom., var. *crokerii*, Swett, which has the green shadings of the typical form replaced by yellow and has an intensely black, irregular median band, which separates it at once from any other variety. It was described by Swett in Can. Ent. XLII., page 278, 1910, from specimens sent to him by Mr. A. J. Croker, of this City (Victoria, B.C.).

The other one is *Hydriomena autumnalis*, Strom., var. *columbiata*, Taylor (Can. Ent. XXXVIII., page 399, 1906). It is easily distinguished by its much larger size and its narrow mesial area, which is shaded with dark cinerous where the typical species is white.

There is also another species like *californiata* occurring here, and that is *Hydriomena irata*, Swett. These two species are separated chiefly by the length of the palpi, which in *irata* is short, not exceeding 1 mm. in length, and is moderately long in *californiata*, and also by the time of their emergence, *irata* flying early in May, while *californiata* does not appear until the end of June. There is generally a period of from six to seven weeks between them.

Hydriomena cdcnata, Swett, is another species which has in some cases been labelled as *californiata*, but is easily distinguished by the wide black bar at the base of the inner margin, and by its much larger size, my specimens being 35 mm. in expanse. Its early appearance would also separate, as it emerges towards the end of March, and is, I believe, the first species of this genus to appear.

Hydriomena speciosata, Packard, which occurs here fairly plentifully, varies but very little, but there is a distinct colour variety of it which is much scarcer, and was first taken by the late Rev. G. W. Taylor at Departure Bay in 1908. It is a very pretty variety, and differs from the normal *speciosata* in having all the pea-green areas of the typical form replaced by olive-brown. It was named *H. speciosata*, Packard, var. *taylori*, by Swett, who described it in Can. Ent. XLII., page 277, 1910.

This concludes my remarks on the more variable species of this genus. There are a few other species I would like to have touched upon, but lack of time prevents me on this occasion.

NOTES ON THE LIFE-HISTORIES OF BLOOD-SUCKING DIPTERA OF BRITISH COLUMBIA, WITH SPECIAL REFERENCE TO THE TABANIDAE.

BY SEYMOUR HADWEN, D.V.SCI., AGASSIZ, B.C.

Mr. Chairman and Gentlemen,—First of all, I intend to give you a list of the species of Tabanidæ which are known to me to occur in British Columbia. I wish to refer to the pioneer work of Mr. R. V. Harvey, who was the first to do any systematic work on this important group of insects, and who published the first list of species. Most of my collecting has been done on the Lower Fraser and on Vancouver Island, and there are doubtless a number of up-country forms yet to be recorded. The determinations of Harvey's specimens were made by Professor Hine, as were also some of my own. Others I sent to the British Museum. This has led to a little confusion in one or two species. For instance, Professor Hine names one of the species *Tabanus insuetus*, O. S.; whereas the authorities at the British Museum refer to it as an *Atylotus*. Hine's *Tabanus fratellus*, Wills., the British authorities name *T. patullus*, Walk. Hine also gives priority to *T. captonis*, Martin, over *T. comastes*, Wills.

I shall now give you a list which Mr. Harvey gave me of the Tabanidæ in his collection. I have collected all these forms myself, and in addition have found three more species which I am adding to his list.

LIST OF TABANIDÆ IN THE COLLECTION OF R. V. HARVEY, VICTORIA, B.C., 1914.

Name.	Specimens.	Locality.	Dates.	Collector.
Pangonia fera, Wills. ...	1	.....	July 8th, 1895	C. V. Piper.
Silvius gigantulus, Loew.	3	Vancouver	July 3rd, 15th, 1903	Harvey.
	1	Grouse Mt., 4,000 ft.	July 9th, 1907	Harvey.
	4	Hope Mts., 4,000 ft.	July 15th, 27th, 1906	Harvey.
Chrysops frigidus, O. S..	2	Hope Mts.	July 27th, 1906	Harvey.
	1	Hope Mts.	July 17th, 1908	Bush.
Chrysops proclivis, O. S.	3	Grouse Mt.	June 24th, 1907	Harvey.
			July 9th, 1907	Harvey.
			July 3rd, 1904	Harvey.
	1	Shawnigan	July 24th, 1904	Harvey.
	1	Laggan	July 22nd, 1901	Osburn.
Chrysops excitans, Walk.	2	Vancouver	June 11th, 1905 ...	Harvey.
	1	Goldstream	Aug. 10th, 1902 ...	Harvey.
	2	Nicolum R.	July 11th, 1906	Harvey.
Chrysops noctifer, O. S..	2	Vancouver	May 13th, 1907	Harvey.
			June 19th, 1903	Harvey.
	1	Grouse Mt.	June 24th, 1907 ...	Harvey.
	1	Cheam Mt., 6,000 ft.	Aug. 10th, 1908 ...	Bush.
	1	Goldstream	July 4th, 1908	Harvey.
	1	Hope Mts.	July 16th, 1906 ...	Harvey.
Tabanus ægrotus, O. S..	1†	Mt. Finlayson, 1,300 ft.	July 18th, 1904 ...	Harvey.
	3‡	Wellington	.....	Rev. Taylor.
Tabanus affinis, Kirby...	2	Victoria	July 20th, 1902 ...	Osburn.
	1	Goldstream	July 20th, 1902 ...	Osburn.
	1	Vancouver	July 25th, 1907 ...	Harvey.
	1	Grouse Mt.	July 9th, 1907	Harvey.
	2	Similkameen	July, 1908	Bush.
Tabanus fratellus, Wills.	1	Port Renfrew	Aug. 10th, 1902 ...	Osburn.
	3	Hope Mts.	July 18th, 25th, 1906	Harvey.
Tabanus sequax, Wills..	4	Grouse Mt.	July 1st, 1904	Harvey.
			July 14th, 1903	Harvey.
			June 25th, 1907 ...	Harvey.
	1	Cheam Mt.	Aug. 11th, 1903 ...	Harvey.
	1	Similkameen	July 24th, 1906	Harvey.
Tabanus sonomensis, O. S.	3	Vancouver	July 18th, 1903	Harvey.
			July 7th, 1906	Harvey.
	5	Grouse Mt.	July 9th, 1907	Harvey.
Tabanus comastes, Wills. (=T. caponis, Martin)	1	Grouse Mt.	July 19th, 1903	Harvey.
	1	Cheam Mt.	Aug. 5th, 1903	Harvey.
	1	Lulu Island	June 16th, 1906 ...	Harvey.
	1	Hope Mts.	July 26th, 1906	Harvey.
Tabanus septentrionalis, Loew.	3	Laggan	July 22nd, 1901 ...	Osburn.
Tabanus osburni, Hine..	1†	Vancouver	June 15th, 1907 ...	Sherman.
	3‡	Field	.....	.....
	4	Hope Mts.	July 14th, 20th, 1906	Harvey.
	2	Similkameen	July 24th, 1906	Harvey.
Tabanus hirtulus, Bigot..	many	Mt. Lehman	.....	Hadwen.
Tabanus nivosus, O. S..	5	Mt. Lehman	.....	Hadwen.
Tabanus insuetus, O. S..	many	Mt. Lehman	.....	Hadwen.

† Male. ‡ Females.

SEASONAL PREVALENCE OF THE DIFFERENT SPECIES.

Chrysops noctifer, O. S., is invariably the first to make its appearance. I have recorded it as early as April 30th (1910). Its season is at its height by the end of May; its numbers then diminish gradually, and by the middle of June very few are to be found. This fly bites cattle and horses on the flanks and shoulders and is a serious pest at times.

Chrysops proclivis, O. S. This fly appears about the middle of May, is a pest in June, and becomes rare towards the end of July. Its biting habits are much the same as those of *C. noctifer*.

Chrysops frigidus, O. S. This is a comparatively rare species. My best catch was of nine specimens on July 15th, 1912. On the 25th of the same month I caught only two. In other years also I have captured only a few specimens.

Tabanus hirtulus, Bigot. This is invariably the first of its genus to appear. It comes in the latter part of May. Its season is at its height in June, and it disappears about the middle of July. It is undoubtedly the worst pest of cattle on the Lower Mainland. It bites on all parts of the body, but is frequently seen on the teats.

Tabanus affinis, Kirby; *Tabanus captonis*, Martin. These flies appear a little after *T. hirtulus*. They are at their worst in July. They bite cattle and horses mainly on the shoulders and face. It seems that animals are very helpless against flies which rest on their faces, especially when they are in the field. In the bush, of course, it is a different matter, as they can simply rub their noses against the bushes.

Tabanus sonomensis, O. S. It appears about July 15th and continues up to the middle of August. It is the most annoying fly after *T. hirtulus*, and bites on the neck, face, shoulders, and flanks. Its bite appears to cause a good deal of pain and hæmorrhage.

Tabanus insuetus, O. S., appears in the middle of July and has a short season. It is not a serious pest in those districts where I have collected it. Most of the flies I have caught were biting on the abdomen.

Tabanus fratellus, Wills. It only occurs in the hottest weather, not before July 15th. This fly is a bad pest; it bites exclusively on the abdomen and might easily be overlooked by the casual observer. Its habits are sluggish; it crawls slowly over the hairs and can easily be taken by hand.

Tabanus nivosus, O. S. Only seen twice; five specimens were caught.

Tabanus sequax, Wills. Only a few captured.

Silvius gigantulus, Loew. Appears in July in limited numbers. It bites the neck by preference.

Tabanus aegrotus, O. S. Taken only on Vancouver Island; occurs in the Dry Belt, but I have not taken it in the Lower Fraser. This is the largest of all the species described. It occurs in July. Considering its size, it seems to cause animals surprisingly little annoyance.

NOTES ON OTHER DIPTERA.

It may be of interest to the members for me to give a few notes on other Diptera.

Stomoxys calcitrans. This fly appears with great regularity about the middle of April. In three different years its first appearance has been recorded, twice on the 20th and once on the 22nd of April at Mount Lehman, Chilliwack, and Agassiz.

Hæmatobia serrata, the horn-fly, and the black-flies, Simuliidæ, appear about the same time, though I cannot give the exact dates. Mosquitoes seem to return each year at almost the same dates, which shows that the seasons must be very similar. In 1910-11 I took careful notes which illustrate this. They were as follows:—

Culicinæ (Notes taken at Mt. Lehman, B.C.).

1910, March 16th; 1911, March 12th. Biting-animals. These were ragged-looking insects and had no doubt survived the winter.

1910, April 21st; 1911, April 25th. First larvæ.

1910, May 18th. Larvæ and egg-rafts found in water-butts.

1911, same period. Not so plentiful.

1910, July 5th. Mosquitoes scarce.

1911, July 5th. Mosquitoes very numerous.

1911, July 5th. Mosquitoes came from the flooded lands of Sumas prairie, which

are about fifteen miles distant from Mount Lehman; they came in on a north wind and took about three days for their journey.

Some of you may wonder how some of these results have been obtained. However, the solution is comparatively simple. With many insects it would appear, I imagine, to be very difficult to determine when their numbers were actually on the increase or decrease, since they have several hosts. But in this case with biting-flies the hosts are limited to domestic animals. As an example of my method of determining the comparative numbers of the different species, I give the records for July 5th, 15th, and 25th, 1911:—

	July 5th.	July 15th.	July 25th.
C. proclivis	25	7	2
T. fratellus	..	30	8
T. affinis	5	9	..
T. captonis	8	16	17
T. hirtulus	21	19	1
T. nivosus	..	4	1
T. insuetus	1	3	7
Silvius gigantulus	3	4	..
Chrysops frigidus	..	9	2
T. sonomensis	..	..	1
C. noctifer	1	..	..
Totals of flies caught	64	101	39

Since I have been living on the Lower Fraser River I have made many attempts to find the breeding-places of the Tabanidæ, up to the present time without success. The country is a difficult one to work in owing to the amount of water, both stagnant and running, and the heavy timber. The place where most of my observations were made was at Mount Lehman. This is a heavily wooded place, surrounded by hills. During the whole time I was there I was never able to capture a male, and the thought struck me that perhaps the flies did not actually breed there. There was one field in which the flies were always plentiful during fine weather. I did my best to find out where they went in wet weather, but without success, although I beat the bushes round the field a number of times. In speaking about this to entomologists in the Province, they one and all agreed that males were more frequently encountered in the mountains, so it appeared to me that there was a possibility of the warm rocks attracting the females also, during the cold weather. There is a crying need for work to be done on the Tabanidæ in Canada. As far as I know, no life-history work has ever been seriously undertaken. The Tabanidæ are insects of great economic importance, and if their life-histories were known it is quite possible that something could be done to reduce their numbers.

In closing, I have to record a new fly for the Province, *Hypoderma lineatum*. I was successful in breeding this fly from the larvæ last summer. I had already taken the larva of this species, but there were no records of the adult fly in our proceedings.

Your President requested me to say something about tick paralysis for the benefit of the members who had not read my paper in "Parasitology."*

I shall conclude my address by expressing the hope that the members of this Society will devote more attention to this important group of blood-sucking flies than has been accorded to them hitherto.

* This information, being already published, is not included in this paper.—SECRETARY.

THE PREPARATORY STAGES OF DIACRISIA KASLOA, DYAR.

BY ARTHUR GIBSON, CHIEF ASSISTANT ENTOMOLOGIST, DIVISION OF ENTOMOLOGY, OTTAWA.

In 1900 we received at Ottawa specimens of a reddish arctian which we placed under the name *Antarctia rufula*, Bdv. These were collected at Kaslo, B.C., by Mr. J. W. Cockle. Two years later (1902) Mr. Cockle sent us eggs of the moth, and notes were taken by me on the preparatory stages. In 1904 Dr. Dyar described the moth as new and gave it the specific name *kasloa*;* one of the co-types was deposited in the Division collection. In the same year the same author described the egg and larval stages.†

As the notes which I made on the preparatory stages of the species are different in many respects from those published by Dr. Dyar, it seems advisable to present them. They are as follows:—

The eggs were received from Mr. Cockle on June 19th, 1902, probably laid on June 12th; hatched June 20th.

Egg.—0.8 mm. in diameter, 0.6 mm. high, shaped like that of *Thymelicus ætna*, Scud.; semi-ovoid; at first pale creamy, changing to a dirty white before hatching; setæ plainly visible at this time; shining, smooth, except under a microscope, when the surface appears slightly roughened.

Larval Stage I.—Length at first 2.2 mm., colour white, the tubercles giving the body the appearance of being striped transversely with black lines. After feeding the larvæ are pale green, the skin shining. Head 0.4 mm. wide, pale brown, ocelli black. Thoracic shield concolorous with head, paler in centre, S-haired. Tubercles greyish-black, shining, i small, ii large and rounded, iii and iv smaller than ii and elongate, about same size, v slightly smaller than iv. Tubercle iii, 2-haired, others single. Setæ long and slender. Between tubercles ii and iii and iv and v a series of reddish-brown blotches are present. Spiracles minute, black. Thoracic feet slightly darker than venter; prolegs smoky exteriorly.

The young larvæ were given sorrel, dock, dandelion, lamb's-quarters, timothy, and lupin, and fed on all of these.

Stage II.—Length 4 mm. Head 0.6 mm. wide, in some specimens wholly pale brown, others pale brown with a smoky patch near vertex of clypeus. Body pale green. The whole skin is now more or less splashed with crimson, quite intense in some specimens, the larger blotches in a line with tubercle ii. Tubercles black, shining, the dorsal series bearing mostly black bristles, and the lower lateral series silvery bristles. A very faint whitish dorsal stripe is present, dividing the thoracic shield, which is reddish in some larvæ and black in others. Feet all concolorous with venter, but bearing blackish plates.

Stage III.—Length 6.5 mm. Blackish larvæ, having a pale-brownish head, a pale-blue dorsal stripe, and bearing slender blackish bristles. Head 1 mm. wide. After one day's feeding the larvæ lose their blackish colour; under a lens the skin appears green, and the whole body is splashed and marked as before, but the blotches are not now so intense in colour, being more of a dark brownish-red, the larger blotches being near tubercle ii, as previously. Tubercles black, shining, i about one-fifth the size of ii, iii as long but not so wide as ii, iv and v smaller than iii. Spiracles very small, black, and immediately above the anterior edge of tubercle iv. Bristles as before, faintly barbed. Thoracic shield blackish. Thoracic feet concolorous with venter semi-translucent, bearing dark plates; prolegs dark smoky.

Stage IV.—Length 11 mm. Head 1.4 to 1.6 mm. wide; yellowish-brown, or yellowish-brown with a large dark-brown patch near apex of clypeus. Blackish larva with black bristles on dorsum and upper portion of sides, and yellowish or rust-red bristles along the lower portion of sides. Dorsal stripe yellowish, in some specimens faint. The ground colour of the skin is greyish-green, but the whole body

* Proceedings of Entomological Society of Washington, VI., p. 18, January, 1904.
† Proceedings of Entomological Society of United States National Museum, XXVII., p. 794.

is mottled and marked with black. Tubercles i and ii wholly black, iii, iv, and v black with a whitish centre, others black. Tubercle iii is widely circled with the ground colour of the body, and in most specimens on the posterior four or five segments. This is tinted with orange. Bristles from tubercles i and ii mostly black, from iii and lower tubercles nearly all yellowish or reddish. Spiracles light yellow ringed with black. Thoracic feet black at apex, reddish towards base; prolegs outside upper two-thirds black, shining, lower third pale, setæ on feet pale reddish.

Stage V.—Length 16 mm. Larvæ in general appearance much as in previous stage. Head 2 mm. wide, same colour and marked as in Stage IV. Under the lens the skin of body is greyish-green, varying in intensity of these colours, marked with splashes or blotches of black, principally on dorsum. Dorsal stripe yellowish or whitish and faint. Tubercles i and ii black, shining; other tubercles whitish. Bristles faintly but distinctly barbed, from i and ii mostly black, remaining ones yellowish or rust-red. Bristles from iii and lower tubercles yellowish or rust-red and black, the reddish ones greatly predominating. Spiracles yellowish, rimmed with black, close to upper anterior edge of iv. Tubercle iii on four posterior segments is rather widely margined anteriorly with orange. Many of the tubercles also bear long, slender, silvery bristles. Thoracic feet pale reddish.

Stage VI.—Length 24 mm. Head 2.5 mm. wide, somewhat quadrate, slightly indented at vertex, flattened in front; yellowish-brown excepting front, which is dark reddish, almost blackish in some specimens, shining; anteclypeus, labrum and antennæ yellowish-white, mandibles dark reddish, setæ yellowish, long and slender. Skin of body almost wholly black, i.e., greyish-green ground colour densely blotched and marked with velvety black, or very dark purple. The dorsal stripe has disappeared in most specimens, in some it is only present on anterior segments. Tubercles large (i about one-third the size of ii), in some individuals all whitish, but in most specimens tubercles i and ii are black, the remaining ones whitish. In some larvæ tubercles iii, iv, v, vi, vii, and viii are black at base, whitish at summit; in others tubercles vii and viii are wholly black. The bristles from the tubercles of most specimens are as in Stage V., but in a few examples all of the bristles from all tubercles are of a pale rust-red colour. Spiracles pale yellowish, black-rimmed. On segments 6 to 13, inclusive, a red patch occurs before tubercle iii, very conspicuous in some specimens, particularly on posterior segments. Thoracic feet reddish, prolegs also reddish, but paler, darkened exteriorly.

On July 18th one larva began to spin its cocoon, and by July 21st had changed to pupa. The cocoon, which is thin, was spun between the leaves in the bottom of the breeding-jar, the pupa being plainly discernible.

Pupa.—Length 15 mm., width at widest part 6 mm., dull reddish-brown; abdomen coarsely punctured; wing-cases and thorax wrinkled; spiracles pale yellow, black-rimmed; cremaster short, blunt, bearing 12 short, capitate bristles of varying lengths.

SNOW-INSECTS.

By J. William Cockle, Kaslo, B.C.

The collecting of entomological specimens is usually associated with the warm months of summer, when the ever-changing hues of gorgeous butterflies, the whir of beetles, the singing of the mosquito, and the hum of bees and flies presents an ever-changing scene before the collector's eye. But allow me to draw your attention for a few minutes to what may be found on a winter day, when the thermometer is down to near freezing-point and the snow lies thick on the ground.

First let me introduce to your notice the snow-fleas of the genus *Aphorura*. Passing over the common black species of this genus, which may be seen in abundance on the melting snows in the spring, and which frequent water-holes and other damp places during the summer months, breeding in soft humus, we next come to one species which is only known to exist at Kaslo. Dr. Folsom has given this species, which is closely allied to *A. siberica*, the name of *A. cocklii*. It is a beautiful

golden yellow and is found at a low altitude having a southern exposure on the banks of Kaslo Creek. They congregate in millions, and when at the height of their emergence completely cover several square yards of snow, turning it to a golden patch. They exist only a few days, and, unlike their black brothers, die in the rivulets of water running off the melted snow. How and when they breed is unknown, and how they contrive to reach the surface of the snow from a depth of 2 or more feet is also wrapped in mystery. I have been unable to devise any suggestion of the whys and wherefores of their presence. I have in my collection specimens of four species of this genus, the golden one only being named, a black species found on melting snow, a smaller black species which breed in hotbeds, a white species found under a flower-pot in the house. None of these are yet identified.

We next come to a larger insect of the genus *Podura*. These may be also collected on the winter snows when the temperature is near freezing. They are very active, and when disturbed spring away several inches and wriggle themselves into any crevasses in the snow. They are about 0.05 mm. in length and dark grey to black in colour.

But possibly the most interesting find of a snow collecting trip are the snow-fleas proper of the family *Boreus*. They may be seen on freshly fallen snow, usually singly, and resemble minute grasshoppers. They are presumed to share the characteristics of the order to which they belong and to be carnivorous in their habits. The late Dr. James Fletcher suggested that they probably fed on the genus *Aphorura* and *Podura*, but of this we have no evidence. Their leaping-powers are great, and I have often observed one jump 6 inches. Their usual mode of locomotion, however, is by walking. The most curious fact about them is that they are so little affected by cold. They will walk around when the temperature is several degrees below freezing, although they are most active when the mercury rises to 35-40 degrees.

In the *Canadian Entomologist* for March, 1908, I published a short paper on the peculiar mating habits of this insect, and more recently I prepared another article which more fully describes the extraordinary method of copulation, which I now take pleasure of presenting to this meeting of our Society. I have in my collection two species of these insects, *B. californicus* and another species which can only be identified from fresh specimens. The latter has a brown stigmatal fold, the wing-coverts black, and the species generally is more hairy. The difference in the colour of the stigmatal fold disappears after drying, so that the disparity cannot be cited as applicable to cabinet specimens.

I have many specimens of Diptera and other orders of flies which I have collected during the winter and have recorded. The capture of Tortricids, Tineids, and Chrysopha found under the bark of dry standing trees during the winter months, and as a systematic collector I am inclined to treasure my winter captures rather than the profusion of forms which are to be found everywhere in the summer.

THE MATING OF BOREUS CALIFORNICUS.

By J. W. Cockle, Kaslo, B.C.

Whilst on the hunt for snow-insects to-day, February 9th, and having been successful in securing several specimens of *Boreus*, I was returning home when I discovered a pair in copulation. The temperature, which had been below freezing all day, had just risen, and at the time was about 33° Fahr. It is well to state here that I have found these curious insects hopping about on the snow when the thermometer showed several degrees of frost, but they are usually most active just after a snow-storm, when the temperature is from 35-40 degrees. Wishing to know how copulation was possible with these curiously formed insects, I lay down on the snow in order to be able to use the small pocket-lens for observation. The female was perched on the back of the male, her front legs folded up so that she

knelt on his back; the second pair rested on the male's back, whilst the longer back pair hung down beside the body of the male.

Then the most curious fact presented itself, that the male was holding the female with its wings, which were hooked over the femora of the front legs. What appeared to be the ovipositor of the female was thrust down perpendicularly into the organ of the male. In this latter observation I subsequently discovered I was at fault, as on February 23rd I again had an opportunity of studying these insects, and instead of being the ovipositor I found that it was the lower half of the ovipositor-shield; the upper portion of the shield remained in a normal position.

The fact of the male using his aborted wings to hold the female during copulation was new to me, as it had never occurred to me to imagine that wings could be placed to such use. My recumbent position on the snow being very unpleasant, I removed the pair to a box, but as they immediately separated I was unable to make any further observation. On February 27th I again had the good fortune to find a second pair mating, and in order to verify the observations I had made on the previous pair of these insects, I proceeded to lift them on a sheet of snow with the aid of a piece of bark. Having done this successfully without disturbing them, I was able to observe them more leisurely. The female in this case had the front pair of legs crossed underneath the body, whilst the other two pairs were folded close against her sides. None of the legs were touching the male at any point. She was held by the male in the same way as in the first pair observed, by the wings of the male being clasped over the femur of the front legs. Both the large bill and antennæ of the female were folded back between the wings of the male. In the case of the first pair observed, I thought that the ovipositor was thrust down into the male organs; this was incorrect. The lower half of the ovipositor-shield is thrust down and is firmly held by the claspers of the male, and the reason I overlooked the male organ is that it is transparent, and viewed against a background of snow is invisible. I pushed the female away from the clasp of the male's wings, but he immediately snapped them together, catching one antenna; upon my releasing this, he commenced to run off, the female being unheld except by the claspers, and such is the strength of this hold that he was able to run around holding the female in an upright position by this support alone. Whenever the legs of the female touched his back, his wings shut like a rat-trap over them; this movement of the wings was repeated at short intervals whenever the legs were removed from this clasp.

I brought them home and was then able to observe the genital organ of the male, which, as I previously stated, is transparent and is directed upward in the inside shell of the ovipositor-shield. This shield opens laterally nearly at its centre; the upper half is stationary, whilst the lower half is capable of being deflected at an acute right angle downward; the tip of this portion which is held by the claspers is armed with short spines and hairs.

The wings of the male, which are less than half the length of the abdomen, are curved downward and are armed on the costal edge with a row of sharp horny spines; there are a few spines on the lower margin. These no doubt add materially to the holding-power and prevent the femora of the female from slipping along the wings. The suggestion is made that, the male being capable of supporting and carrying the female by the hold of its claspers, an examination of these might add to the knowledge of the structure of these insects and the reason why such a support is possible. Upon reaching home I placed the specimens under a glass for further observation; the female, being unheld and having regained her feet, was able to tow the male around on his back; this she continued to do for two hours, but during the first portion of the time the male made frantic efforts to regain his feet, and also to snap his wings over some appendage to the female, but in this he was unsuccessful; it was all to no purpose; she dragged him to death, or very near it, and it was only when I pinched her with my forceps and rendered her partially paralysed that separation from the male took place. When this

occurred I was able to fully observe the transparent male organ. I am not aware how far the mode of holding the female may be practised by other insects having a like structure to this, but this record can stand as to what extraordinary use the wings may be put and their adaptability for the purpose for which they were created.

February 27th. I went out to-day on a special hunt for *Borcus*, armed with vials of ether and alcohol. The first pair I discovered I dropped into the vial of ether, but they separated instantly. The second pair I decided to try to freeze, so lifted them and transferred them to a box of snow. The male released his wing-hold and ran around with the female in an upright position, holding only by the claspers. The female made no effort to extend her legs, but kept them in the previously described position, folded close to the body. The male made repeated efforts to regain his wing-hold by jerking the abdomen upward, thus throwing the female forward within reach of his wings, which snapped together at every such effort. I left them quiet in the box of snow and the male soon regained his wing-hold. Upon my pouring a little ether on the snow and closing the box in the hope of reducing the temperature to a sufficiently low degree to render them comatose, the male again released his wing-hold. It seemed thus impossible to kill them in the desired position. I transferred them to the vial of ether. I think the female can release herself even at the instant of death, and it remains yet to be seen if I can succeed in freezing them in the desired position by the aid of a freezing mixture applied outside to the box in which they are enclosed.

INSECTS COLLECTED IN THE OKANAGAN VALLEY, 1913.

BY E. M. ANDERSON, PROVINCIAL MUSEUM, VICTORIA.

Early in April, accompanied by an assistant, Mr. C. B. Garrett, I was detailed by the Department to collect birds and mammals for the Provincial Museum, Victoria, B.C. Although my work was chiefly confined to collecting and preserving birds and mammals, we managed to secure about 4,000 entomological specimens. A large number of very interesting forms of insect-life fell to the net, many specimens still awaiting identification, mostly in Coleoptera, Hymenoptera, and Diptera.

From my point of view, the Okanagan Valley offers to the entomologist one of the best collecting-grounds in British Columbia, and I feel certain that, with a season's systematic research, an enthusiastic student would add many species to the British Columbia list, which is far from being complete.

The weather during the early part of April was very unsettled, still keeping cold and wet, and nothing much in the insect line could be found save a few beetles, crickets, and a small scorpion under bark. After collecting a week at Penticton, we moved camp south sixteen miles to Shuttleworth Creek, a distance of about two miles from Okanagan Falls. On arrival at the creek things began to look brighter, the sun was shining, and we observed a number of insects on the wing. Here we camped from April 15th to 20th, taking at intervals a series of the early blue *Cyaniris nigrescens*, *Incisalia cryphon* and *I. iroides*, *Pontia sisymbri*, *P. occidentalis*, *Synchlœ creusa*, *Ausonides*, and *Sara*, the beautiful orange-tip. A few Noctua were collected at light, the nights still keeping cool; nothing but an occasional *Xylomiges simplex*, or common Geometer, made their appearance. *Drasteria crassiuscula* and *Leptarctia californiata* were common about the camp on sunny days.

On April 20th we moved camp to Schoonover Cabin, an old trapper's home in the mountains at an elevation of about 3,500 feet. With an early start, accompanied by Charlie Shuttleworth and two pack-horses, we started on our way up the mountain-side through a drizzling rain, which shortly afterwards turned into sleet and snow, this making travel slow over the slippery mountain-trail. We travelled about five hours, arriving at the cabin about 1 p.m. The horses, tired out, were immediately unpacked, a camp-fire made, and after a meal of hot coffee

and beans we were soon warmed through and felt fine after our tramp of about ten miles.

The weather was anything but promising for insect-life during our stay of a week, amidst continual sleet and snow falls, only seeing the sunshine for an hour or so at a time. Nevertheless, it was remarkable how much insect-life could be found as soon as the sun made its appearance after a snow-storm. *Pontia occidentalis*, *P. sisymbri*, *Synchloe creusa*, *Thecla eryphon*, *T. mossi*, and *Euclidea cuspidea* were fairly common close to the cabin in a sheltered clearing in the woods. Several small day-flyers and a few specimens of Hymenoptera and Coleoptera were also taken.

We departed from Schoonover Cabin at 1 p.m. on April 26th, arriving at Shuttleworth Creek about 5 p.m. *Thecla iroides* and *Lycæna nigrescens* were common in spots along the mountain-trail. With the use of a lantern we collected every fine night in camp, but with little success, only a few *Cucullia* and Geometers being attracted by the light. Being disgusted with our previous catches, we decided to try our luck in an orchard a short distance from the camp.

On the night of May 5th moths were found in countless numbers feeding on cherry and peach blossoms. By spreading a blanket under the tree and shaking the branches carefully, a dozen or more moths would fall intoxicated to the ground, and with the use of a lantern and forceps the desired specimens were quickly placed in killing-bottles and pinned and labelled the following day. We collected long interesting series of *Mamestra*, *Xylina*, *Xylomiges*, *Graphiphora*, and other early moths mentioned in list of captures in the following pages. About 1,000 moths were taken in two nights.

The most undesirable of insects during April and May were the ticks, which were so abundant in the grease-wood benches in the vicinity of our camp that Mr. Garrett and I were both badly bitten, and at times the jaws of ticks were found well buried under the skin, and had to be removed with a lance, absolutely refusing to release themselves when coal-oil or the lighted end of a cigar or cigarette was applied (a method frequently used by settlers).

On May 16th another camp was pitched at Vaseaux Lake, seven miles south of Okanagan Falls. Camping close to the roadside and lake-shore, we were situated in an ideal spot for collecting. We managed to find time to collect daily during the heat of the day, taking scores of *Papilios*, *Lemonias*, *Pontias*, *Synchlœs* (orange-tips), skippers, and blues, and many others too numerous to mention.

A second trip to Schoonover Mountain was made with the aid of pack-horses on June 1st, returning to Vaseaux Lake on June 6th. The trip over the mountain was a pleasant one, and instead of encountering rain and snow, as in April, the weather was at its best, trees and wild flowers were in splendour, and nature seemed at peace with all the world. In crossing Schoonover prairie, insects were found in thousands—blues, skippers, *Erebias*, *Brenthis*, *Alypias*, etc.—and many small day-flyers hovered all round us as we wended our way through the tall grass. The prairie is a beautiful grassy plateau at an altitude of about 3,000 feet on the south side of Schoonover Mountain.

Returning from the mountain, we camped from June 6th to July 8th at Vaseaux Lake, Dog Lake, Okanagan Falls, and Penticton. Considerable rain fell in June; nevertheless, we took advantage of all the fine weather and added a large variety of insects to our collection. It was remarkable to note the disappearance of certain species of Lepidoptera after a heavy rainfall of two or three days' duration. Some insects quite common previous to a wet spell were entirely wiped out of existence; this was noticed principally among the blues and *Theclas*. The skippers and other forms seemed to survive all weather conditions throughout the season.

I shall endeavour to make a list of the most important captures. There still awaits a number of insects to be classified and arranged in the Museum collection.

Before concluding, I wish to thank Mr. C. B. Garrett for his valued assistance in the field, and also for his careful and painstaking methods in the preservation of the specimens.

Lepidoptera (Butterflies).

Papilio daunus. Common, May and June, Vaseaux Lake.
Papilio eurymedon. Common, May and June, Vaseaux Lake.
Papilio rutulus. A few taken at Vaseaux Lake, May 20th to 30th.
Papilio turnus. Vaseaux Lake, Schoonover Mountain, May 15th, June 6th.
Papilio zolicaon. Common, Okanagan Falls, May 10th; Schoonover Mountain, June 1st to 6th.
Pontia beckeri. Osoyoos, May 23rd.
Pontia sisymbri. Okanagan Falls, April 12th, May 15th. Common.
Pontia occidentalis. Okanagan Falls, April 12th, May 15th. Common.
Pontia rapæ. Okanagan Falls, April 12th, May 15th. Common.
Synchloe creusa. Okanagan Falls, April 12th, May 15th. Common.
Synchloe ausonides. Okanagan Falls, April 12th, May 15th. Common.
Synchloe sara. Okanagan Falls, April 12th, May 15th, and June 6th. Common.
Eurymus eriphyle. Vaseaux Lakke, Okanagan Falls, May 20th to June 20th. Common.
Eurymus hatfordii (?). Okanagan Falls, May 25th.
Eurymus occidentalis. Vaseaux Lake, May 18th; Osoyoos, May 25th.
Brenthis freija. Schoonover Mountain, common, June 1st to 6th.
Brenthis bellona. Schoonover Mountain, common, June 1st to 6th.
Brenthis epithore. Schoonover Mountain, common, June 1st to 6th.
Lemonias cooperi. Okanagan Falls, Vaseaux Lake, June 1st.
Lemonias palla. Vaseaux Lake, June 1st to 10th.
Lemonias whitneyii. Vaseaux Lake, June 1st to 10th.
Lemonias baroni (?). Vaseaux Lake, June 12th.
Phyciodes pratensis. Okanagan Falls, June 11th.
Phyciodes mylitta. Vaseaux Lake, June 10th.
Eugonia californica. Schoonover Mountain, June 1st.
Euvanessa antiopa. Okanagan Falls, April 15th.
Basilarchia archippus. Vaseaux Lake, May 14th to 30th.
Basilarchia lorquini. Penticton, June 30th.
Cercyonis charon. Vaseaux Lake, June 15th.
Erebia epipsodea. Vaseaux Lake, Schoonover Mountain, June. Common.
Cœnonympha elko. Vaseaux Lake, Schoonover Mountain, May 15th and June.
Anosia plexippus. Vaseaux Lake, May 15th to 30th.
Uranotes melinus. Okanagan Falls, May 20th.
Callipsyche behrii. Vaseaux Lake, June 26th.
Incasalia iroides. Okanagan Falls.
Incasalia mossi. Schoonover Mountain, June 1st to 6th.
Incasalia eryphon. Okanagan Falls, Schoonover Mountain, May 4th, June.
Epidemia zerœ. Vaseaux Lake, June 10th to 15th.
Epidemia helloides. Vaseaux Lake, June. Common.
Cupids heteronea. Schoonover Prairie, June 1st to 6th.
Cupids fulla. Okanagan Falls, Schoonover Mountain, common, May 20th to June 6th.
Cupids sæpiolus. Okanagan Falls, Schoonover Mountain, common, May 20th to June 6th.
Nomiades antiacis. Common everywhere in the valley, May and June.
Nomiades couperii. Schoonover Mountain, June 1st to 6th.
Phædrotes sagittigera. Schoonover Mountain, June 1st to 6th.
Rusticus melissa. Vaseaux Lake, June 10th to 15th.
Rusticus anna. Vaseaux Lake, June 10th to 15th.
Cyaniris nigrescens. Common in April and May, Okanagan Falls.
Everes comyntas. Vaseaux Lake, May 20th.
Amblyscirtes vialis. Common in May and June, Okanagan Falls.

Pamphila palæmon. Schoonover Mountain, June 1st to 6th.
Erynnis manitoba. Vaseaux Lake, May 30th; Schoonover Mountain, June 5th.
Thymelicus cernes. Schoonover Mountain, June 3rd.
Thorybes pylades. Okanagan Falls, June.
Pholisora catullus. Okanagan Falls, Schoonover Mountain, June 1st to 6th.
Thanaos icelus. Vaseaux Lake, May 30th.
Thanaos persius. Okanagan Falls, June 1st.
Hesperia cæspitalis. Okanagan Falls, Schoonover Mountain, May and June. Common.

HETEROCERA (MOTHS).

Lepisesia ulalume. One rubbed specimen, Schoonover Mountain, June 3rd.
Marumba modesta. Penticton, July 5th; one specimen.
Samia columbia. Okanagan Falls, June 10th; one specimen.
Scepsis cockleyi (?). Penticton, June 28th; two taken at light.
Leptarctia californiata. Okanagan Falls, common in April and early part of May.
Isia isabella. Penticton, July 5th.
Apantesis achaia, var. ornata. Vaseaux Lake, May 30th to June 10th; six specimens taken.
Androloma maccullochi. Common at Schoonover Mountain, June 1st to 6th.
Hadena cogitata. Penticton, July 3rd.
Xylomiges simplex. Okanagan Falls, common in May; took five in orchard.
Xylomiges perlubens. Okanagan Falls, common in May.
Xylomiges candida. Okanagan Falls, common in May.
Grapiphora pacifica. Okanagan Falls, common in May.
Stretchia normalis. Okanagan Falls, May 6th to 8th.
Xylina contenta. Common on blossoms, May 6th.
Cucullia (?). Okanagan Falls, May 1st to 5th; at light.
Rancora solidaginis. Okanagan Falls, May 3rd; at light.
Orthosia crispa (?). Okanagan Falls, May 5th.
Heliothis (?). Vaseaux Lake, May 22nd; one specimen.
Drasteria erechtea. Okanagan Falls, May 5th to 20th.
Drasteria crassiuscula. Okanagan Falls, May 12th to 20th.
Euclidea cuspidea. Okanagan Falls, May and June. Common.
Nadata gibbosa. Penticton, June 5th; one specimen at light.
Gluphisia septentrionalis. Okanagan Falls, April 28th; one specimen at light.
Euthyatira pudens. Okanagan Falls, May 6th; one specimen at blossoms.

GEOMETRIDÆ (GEOMETERS).

Tephroclystis (? sp.). Okanagan Falls, May 1st to 10th; at light.
Hydria undulata. Okanagan Falls, April 27th; at light.
Eois sideraria. Schoonover Mountain, June 1st to 6th. Common.
Lycia cognataria. Penticton, July 6th to 8th.
Marmopteryx marmorata. Okanagan Falls, May 4th.
Brephos infans. Okanagan Falls, May 1st.

COLEOPTERA (BEETLES).

The following is a list of beetles collected in the Okanagan Valley. A miscellaneous collection of over 1,000 still awaits classification:—

Coccinella transversalis.
Comontis ovalis.
Corymbites fallax.
Trogisita chloridea.
Trichodes ornatus.
Platynus subsericeus.
Chalaeins interuptus.
Creophillus villosus.
Clerus sphegus.
Elodes cordata.

Didolonycha fulgida.
Saprinus lugens.
Lachnosterna errans.
Cincindella oregona.
Cincindella obliquata.
Haltica bimarginata.
Chalcophaga angulicollis.
Podabrus comei.
Silpha lapponica.
Necrophorus melschemeri.
Meloe montanus.
Geoderces melanothrix.
Cleonus 4 lineata.
Rhagium lineatuna.
Leptura lætifica.
Ellychnia californica.

A TRIP UP MOUNT CHEAM.

By A. H. Bush.

Mount Cheam stands on the south bank of the Fraser River, overlooking Agassiz. It is a beautiful mountain and an ideal collecting-ground, both from an entomological and botanical standpoint. It takes the greater part of a day to reach timber limit, where a fine choice of camping-grounds await the weary climber. Starting from the Fraser River, we pass through some heavy timber and dense underbrush which is characteristic of this district. The maidenhair fern (*Adiantum pedantum*) and deer-grass (*Aclys triphila*) grow here in great profusion. Some distance up the side of the mountain the underbrush gradually thins out and the character of the timber changes. At 4,000 feet we have lost the Douglas fir and cedar, the white fir and hemlock taking their places. Between 5,000 and 6,000 feet up we pass many open glades, and here the first alpine flowers are encountered. We pass knee-deep through the large mountain-musk (*Mimulus lewisii*) and patches of heather, and so up through these park-like hillsides we climb till we reach the ridge, when the splendid beauty of the mountain bursts on our view.

To the south, west, and east stretch meadows and rolling hillsides, a blaze of colour with flowers of many kinds. Over these meadows tower the rock and snow peaks of "The Lady" and "The Angel." Here we pitch camp convenient to some stream or snow-bank. Close to and occasionally forcing their way through these snow-banks, we find the glacial lilies with their beautiful golden flowers, amidst, possibly, various patches of red snow. This later phenomenon is caused by a microscopic fungus which gives the snow a pink or blood-red appearance. In the wet hollows, formed by melting snow, the ground is covered with a carpet of buttercups. All colours of flowers are to be seen, for on the hillsides the white valerian, the red painter's-brush, and the blue lupines form the most conspicuous colours. In passing along the hillside we notice a plant 3 or 4 feet high with large green leaves and a spike of bright-green flowers. This is called "*Veratrum viride*." We see, again, acres of mountain-blueberry only a few inches high, and on the ridges masses of the light-purple phlox, spiræa, and rock roses. At our feet we may find the Arctic willow, which rises only 3 or 4 inches from the ground.

At the summit of the mountain, which is formed of broken slate, we see thousands of ladybirds in the cracks of the rocks. Why they should congregate thus on a mountain-peak awaits explanation. Here also many butterflies are seen—"painted-ladies," white argynnis, "chequer-spots," *Vanessas*, *Erebias*, various "blues," and occasionally some rare tiger-moths such as *Neoarctia parrowii* and *N. brucii*. The moths are well represented on the mountain. Many Noctuids have been taken, which all appear to fly in the daytime, no doubt on account of the cold nights. Bees and wasps are very plentiful, and the flowers of the mountain-ash form a fine banqueting-hall for flies and beetles.

Looking down into the valley, we see the districts surrounding Agassiz and Chilliwack spread out like a chequer-board, with the river like a silver ribbon flowing along. Beyond Agassiz, Harrison Lake can be seen for forty miles of its course, with "Fire" Mountain at its head. To the south the majestic summit of Mount Baker, covered with its eternal snow-cap, greets the eye; and this is the scene before us

as we lie around the camp-fire in the eternal stillness, thinking of the glare and noise of the city streets, and so concluding that it is good for us to be here.

In conclusion, I wish to record the occurrence of several beetles that I have had in my collection for several years.

The following insects have been identified by Dr. E. C. van Dyke, of Berkeley University, California, from specimens collected in British Columbia:—

(2.) Omus dejeani, Reid ..... Vancouver, April 20th, 1902.
(33A.) Cicindela oregona, Lec. (var.) ..... Stikine, 1904.
(106.) Cychrus tuberculatus, Harr. ..... Nicomen, Sept. 12th, 1903.
(92.) Scaphinatus (Cychrus) angusticollis, Fisch Stikine, 1904.
(96.) Scaphinatus (Cychrus) marginatus, Fisch Stikine, 1904.
(172.) Opisthius richardsoni, Kirby ..... Stikine, 1904.
(188.) Nebria metallica, Fisch.
(508.) Pterostichus amethystinus, Dej. ..... Vancouver, April 26th, 1903.
(671.) Amara farcta, Lec. (var.) ..... Vancouver, April 26th, 1902.
(658.) Amara littoralis, Mann.
(682?.) Amara subænea, Lec. ..... Mount Cheam, Aug. 11th, 1903.
(1484.) Dytiscus marginicollis, Lec.
(1706.) Silpha lapponica, Hbst. ..... Cherry Creek, July 12th, 1903.
(1472.) Colymbetes strigatus, Lec. ..... Mount Cheam, Aug. 10th, 1903.
(1492.) Acilius semieulcatus, Aubc. ..... Mount Cheam, Aug. 10th, 1903.
(1701A.) Necrophorus melsheimeri, Kirby ..... Vancouver, Aug. 17th, 1903.
(1715.) Necrophilis hydrophiloides, Mann ..... Vancouver, May 14th, 1903.
(2119.) Oreophilus villosus, Grav. ..... Vancouver, May 7th, 1904.
(2116.) Listrotrophus cingulatus, Grav.
(2140.) Staphylinus rutilicanda, Horn.
(3848.) Peltis pippingskoeldi, Mann ..... N. Vancouver, April 27th, 1902.
(3850.) Calitys scabra, Thub. ..... Vancouver, June 7th, 1903.
(3984.) Araeopus monachus, Lec. ..... Vancouver, May 8th, 1902.
(3316A.) Cucujus puniceus, Mann ..... Vancouver, May 23rd, 1905.
(3891.) Byrrhus geminatus, Lec. (?) ..... Vancouver, June 15th, 1904.
(3080.) Chilocorus bivulnurus, Muls.
(3041.) Hippodamia 5-signata, Kirby ..... Revelstoke, July 29th, 1904.
(3049.) Hippodamia sinuata (var.) ..... Vancouver, May 17th, 1909.
(3050.) Hippodamia 13-punctata, Linn. ..... Vancouver, Sept. 20th, 1905.
(3060.) Coccinella monticola, Muls. ..... Cherry Creek, July 12th, 1903.
(3059.) Coccinella transversoguttata, Fab. ..... Revelstoke, July 21st, 1904.
(3056.) Coccinella trifasciata, Linn. ..... Vancouver, April 20th, 1903.
(3064.) Coccinella sanguinea, Linn. ..... Vancouver, April 20th, 1903.
(2802.) Tilea cavicollis, F.
(4095.) Alaus melanops, Lec.
(4077.) Adelocera rorulenta, Lec. ..... Vancouver, May 17th, 1906.
(4485.) Corymbites suckleyi, Lec. ..... Vancouver, May 25th, 1903.
(4486.) Corymbites aeripennis, Kirby ..... N. Vancouver, April 27th, 1902.
(4484.) Corymbites cruciatus, Linn. ..... Vancouver, May 8th, 1902.
(4433.) Corymbites resplendens, Esch.
(4470.) Corymbites angusticollis, Mann ..... Vancouver, May 13th, 1904.
(4452.) Corymbites Monticola, Horn ..... Vancouver, May 3rd, 1902.
(4446.) Corymbites volitans var. umbricola, Esch... Grouse Mtn, June 26th, 1903.
(4297.) Dolopius lateralis, Esch. ..... Vancouver, March 29th, 1903.
(4245.) Elater apicatus, Say ..... Vancouver, April 12th, 1903.
.... Elater phœnicopterus, Germ. ..... Vancouver, May 3rd, 1903.
(4784.) Eros hamatus, Mann ..... Vancouver, May 13th, 1904.
(4814.) Ellychnia californica, Mots. ..... Vancouver, May 25th, 1902.
(4956.) Telephorus divisus, Lec. ..... Vancouver, April 26th, 1902.
(5178.) Enoclerus sphegeus Fab. ..... Vancouver, May 29th, 1904.

(4568.) Chalcophora angulicollis, Lec.
(5158.) Trichodea ornatus, Say ..... N. Vancouver, July 19th, 1903.
(4610.) Buprestis aurulenta, Linn.
(4607.) Buprestis fasciata, Fab. ..... Hope, Aug. 21st, 1903.
(4607a.) Buprestis fasciata var. langii, Mann ..... Vancouver, June 28th, 1903.
(4606b.) Buprestis rusticorum, Kirby.
(4646.) Chrysobothris carinipennis, Lec. ..... Kaslo, July 25th, 1904.
(4621.) Melanophila drummondi, Kirby (var.) ..... Cherry Creek, July 12th, 1903.
(4619.) Melanophila acuminata, De Geer ..... Vancouver, July 8th, 1903.
(5417.) Platycerus oregonensis, West ..... Vancouver, May 21st, 1903.
(5421.) Ceruchus striatus, Lec.
(5423.) Sinodendron rugosum, Mann.
(5594.) Odontaeus obesus, Lec.
(5686.) Serica anthracina, Lec. ..... Revelstoke, July 29th, 1904.
(5537.) Aphodius pardalis, Lec. ..... Revelstoke, Oct. 29th, 1903.
(5948.) Spondylis upiformis, Mann ..... Stikine, 1904.
(5967.) Tragosoma harrisii, Lec.
(5974.) Criocephalus productus, Lec. ..... Vancouver, Aug. 1st, 1905.
(5992.) Hylotrupes ligneus, Fab. ..... Vancouver, April 10th, 1904.
(6002.) Phymatodes dimidiatus, Kirby ..... Stikine, 1904.
(6183.) Xylotrechus undulatus, Say ..... Vancouver, July 18th, 1903.
(6232.) Rhagium lineatum, Oliv. ..... Vancouver, April 27th, 1902.
(6219.) Atimia dorsalis, Lec. ..... Vancouver, May 22nd, 1903.
(6249.) Pachyta armata, Lec. ..... Mount Cheam, Aug. 7th, 1903.
(6247.) Pachyta monticola, Rand (var.) ..... Vancouver, April 13th, 1904.
(6274.) Acmæops pratensis, Laich ..... Nelson, July 23rd, 1904.
(6341.) Leptura chrysocoma, Kirby ..... Kaslo, July 26th, 1904.
(6340.) Leptura quadrillum, Lec. ..... Popcum, July 31st, 1903.
(6346.) Leptura dolorosa, Lec. ..... Popcum, July 31st, 1903.
(6332.) Leptura canadensis, Lec. ..... Sicamous, July 31st, 1904.
(6327.) Leptura matthewsii, Lec.
(6299.) Leptura obliterata, Hald. ..... Vancouver, Aug. 1st, 1905.
(6360.) Leptura valida, Lec. ..... Vancouver, Aug. 6th, 1905.
(6387.) Monohammus scutellus, Say.
(6348.) Leptura crassipes, Lec. ..... Revelstoke, July 21st, 1904.
(6367.) Plectrura spinicauda, Mann ..... Vancouver, June 23rd, 1910.
(6228.) Ulochætes leoninus, Lec. ..... Vancouver, Aug. 5th, 1904.
(6513b.) Tetraopes basalis, Lec. ..... Cherry Creek, July 12th, 1903.
(7656.) Phryganophilus collaris, Lec. ..... Vancouver, May 22nd, 1904.
(7729.) Ditylus gracilis, Lec. ..... Vancouver, April 20th, 1902.
(6741.) Chrysochus auratus, Fab. ..... Cherry Creek, July 12th, 1903.
(6805.) Calligrapha elegans, Oliv. (var.) ..... Chilliwack, May 15th, 1908.
(6907.) Galerucella decora, Say (var.) ..... Vancouver, May 14th, 1903.
(6837.) Melasoma lapponica, Linn. (var.) ..... Stikine, 1904.
(6332.) Leptura canadensis var. bena, Leng.
(6810a.) Calligrapha bixbyana, Kirby ..... Harrison, July 30th, 1903.
(7724.) Calaphus angustus, Lec. (?) ..... Vancouver, April 11th, 1903.
(7726a.) Phellopsis porcata, Lec.
(7394.) Iphthimus serratus, Mann ..... N. Vancouver, April 13th, 1902.
(8158.) Cantharis sphæricollis, Say ..... Vernon, Aug. 1st, 1904.
(8092.) Epicauta maculata, Say ..... Cherry Creek, July 12th, 1903.
(8474.) Pissodes fasciatus, Lec.
(8438.) Lepyrus geminatus, Say ..... Stikine, 1904.
(8471.) Plinthus carinatus, Boh.
(8260.) Dysiobus segnis, Lec. ..... Grouse Mtn., June 3rd, 1910.
(6742.) Chrysochus cobaltinus, Lec. ..... Revelstoke, July 29th, 1904.

SOME OBSERVATIONS ON THE HYMENOPTERA OF THE OKANAGAN.

BY E. P. VENABLES, VERNON.

In speaking upon this group of insects, I should state at the outset that I have done little active work in the order for some years now. But as I have brought together a fair collection, comprising representatives of most of the families, it may be of interest to give the notes that I have of the various species.

This district is undoubtedly a favoured spot as regards the Hymenoptera, and careful work among any of the families would bring to light many new and interesting forms. During the coming season I propose to work at the sawflies, and shall hope to get some notes of interest. The Hymenoptera include some of the most beneficial and at the same time the most interesting insects known. We have only to consider the vast number of parasitic forms to be found in the superfamilies Ichneumonoidea and Chalcidoidea, without the intervention of which most species of leaf-eating caterpillars would soon devastate all plants, both wild and cultivated. We find in the former group a great assemblage of parasitic forms ranging in size from some 2 inches in length down to others of quite microscopical dimensions. As to numbers, it is enough to state that Ashmead, who worked at the genera of the world, recognized 1,140 distinct genera of these strictly beneficial insects. The Chalcidoidea is considered to be probably the largest in numbers of species of any of the Hymenopterous groups; only a few of these have so far been described. They are with few exceptions parasitic in habit, some of the species being found as egg parasites within the eggs of other insects, a few producing certain plant-galls.

The ants, bees, and wasps are undoubtedly the most interesting as well as the most highly developed of all insects exhibiting that complicated but orderly communal life such as is found in every ant-hill or bees' nest, the study of which reveals some almost astounding facts, both as regards division of labour and also, as among ants, symbiosis of a highly complicated nature.

There are many hundreds of different species of insects found inhabiting the tunnels and galleries of ants' nests in different parts of the world, some of which are able to furnish the ants with certain secretions from glands situated in different parts of the body, as is the case with the larvæ of certain Lycæna, butterflies which are found attended by ants, for the purpose of feeding upon the excretions of honey-dew which is extruded by the Lycæna larva from a specialized gland situated on the dorsal surface of the abdomen. We have also the case well known to all who have paid any attention at all to insects of the consociation of ants and aphides. This well-known phase of ant behaviour has not been acquired by all ants, for although many species have developed the habit and have in the course of time learnt to take great pains to secure the excretion of the aphides, some species, in fact, building roofs over the colonies of these insects to protect them, others, as exampled by certain carnivorous groups, care nothing for the plant-lice and never, so far as is known, feed upon their excretion. It is not uncommon to find in early spring, on opening an ants' nest, numbers of aphis-eggs which have been taken in for protection by the ants in the autumn. When these eggs hatch the ants remove the young aphides to their natural food-plant near the nest, and so ensure a supply of honey-dew for the summer months. There are many other insects found to inhabit ants' nests. Many Coleoptera, Homoptera, and scale-insects may be found. These latter furnish excretion for the ants and are protected by their hosts.

The beetle *Cremastocheilus pilosicollis* I have found frequently in the galleries of nests beneath stones, etc. Wheeler states that the ants employ themselves gnawing the anterior thoracic angles of these beetles. I might state, to show the intricacy of the phase of the subject, that there have been enumerated by Wassmann no less than 1,246 species of various small animals, "not only insects, but certain spiders and crustacea, known to inhabit ants' nests either as true guests, or tolerated scavengers, or as persecuted intruders."

Volumes might be written upon this most interesting group of insects, and any one proposing to work upon the ants would do well to examine some of Professor Wheeler's papers upon the group.

Before leaving the subject of ants, I should like to mention those most interesting species, the fungus-ants. These interesting creatures, first carefully observed by Belt in Nicaragua, have developed the extraordinary faculty of cultivating for food a certain species of fungus which is grown by the ants upon decaying leaves that are brought to the nest for that purpose. This fungus is only known to be produced in the nest of ants of tropical and sub-tropical America. The tribe to which they belong, the "Attii," consists of about 100 species, all of which are known to be cultivators and eaters of this peculiar fungous growth.

It had constantly been remarked by travellers in the tropics that vast numbers of ants were found engaged in carrying into their nests quantities of freshly cut leaves; that these leaves served as food was for a long time taken as the explanation of the phenomenon. But careful observation led to the discovery that the leaves were used as a manure for raising the crops of fungous plants for the food of the ant colony. It is grown within certain large chambers of the nest and is fed upon by the larvæ and adult Attii. When a colony is disturbed the ants remove every particle of the fungous masses to a new site, and again in forming a new colony a supply is carried along by the ants with which to stock their new quarters.

We might dilate upon the many other strange facts of ant behaviour which have in the last few years been made known by various careful workers, but I think that enough has been given to show the intense interest of the study. I will now give you a short list of the species of the Hymenoptera that I have found in my somewhat desultory collecting, but I hope it may be the nucleus of a far more comprehensive and complete list in the future for this country compiled by the co-operation of many of our members.

Among the earliest and most noticeable of the Hymenoptera are the various species of Bombidæ, of which I have representatives of some sixteen species in my collection. In their relation to the cross-fertilization of plants, the insects of this group are of the greatest importance and benefit to agriculture, for without their presence many of the most valuable plants would never set their seed.

In the Okanagan we have the following species:—

Bombus melanopygus (the most showy species of the genus and the first to appear in the spring).
Bombus rufocinctus.
Bombus appositus.
Bombus nearcticus.
Bombus juxtus.
Bombus couperi.
Bombus nevadensis (the largest species).
Bombus fervidus.
Bombus occidentalis.
Bombus vancouverensis.
Bombus edwardsii (Vanc.).
Bombus vagans.
Bombus pennsylvanicus.

Psithyrus insularis, a parasitic form in the Andrenidæ or short-tongued bees, I have the following species, viz.:—

Andrena illinoiensis.
Andrena nigrocoerula.
Halictus ligatus.
Halictus montanus.
Halictus lerouxii.
Halictus pacificus.
Synalonia nevadensis.
Synalonia edwardsii.
Megachile frigida.
Cœlioxus rufitarsus.

The following wasps are to be found commonly:—

Vespa diabolica (also from Vancouver).
Vespa fernaldi.
Vespa maculata.
Vespa marginata.
Vespa occidentalis.
Polistes bellicosus.
Polistes aurifer.
Polistes pallipes.
Polybia flavitarsus.
Trachytes pepticus.
Psamophila robusta.
Sphex ichneumonea.

I also have thirty-two species of Tenthredinidæ, as follows:—

Cimbex americana.
Tenthredo nigrocostata.
Tenthredo varipictus.
Tenthredo variegatus.
Tenthredo mellina.
Tenthredo morosa.
Tenthredo evansii.
Urocerus cyaneus.
Urocerus albicornis.
Sirex flavicornis.
Sirex abdominalis.
Dolerus bicolor.
Dolerus aprilis.
Monohadmus rubi.
Monohadmus medius.
Monostegia rosæ.
Lophyrus abiatis.
Steonlyogaster fidus.
Haplocampa spissipes.
Hylotoma clavicornis.
Hylotoma abdominalis.
Hylotoma mcleayi.
Monophadnus tibiæ.
Macrophya tibiator.
Macrophya fumator.
Pachynematus extensicornis.
Pachynematus clypeatus.
Poecilosoma maculata.
Trichiocampus gregarius.
Haplocampa montana.
Ubia americana.

I also have some unnamed species in this group, and would feel it a favour to exchange with any of the members, either in this family or any other in which they are interested. In the early days of our Society we had, if I remember rightly, a considerable list of insects compiled by the different members, and if this list is still preserved it would no doubt be of value to draw up a catalogue of British Columbia entomology, or perhaps a copy might be made and utilized in the forthcoming list at present being worked up by our parent Society on Canadian insects.

I regret I am unable to be present at this meeting, but the distance is somewhat great. I regret also not having been able to attend the Vernon meeting during last summer, but nevertheless the Society has my best wishes and continued support.

REPORT OF THE FIFTIETH ANNUAL (JUBILEE) MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

BY R. C. TREHERNE, EXPERIMENTAL FARM, AGASSIZ.

On August 27th, 28th, and 29th, 1913, at the Ontario Agricultural College, Guelph, Ontario, a special meeting of the Ontario Entomological Society took place, in commemoration of the fact that the Society had been in existence and active for exactly fifty years. The meeting was not to be missed, as it was of historic interest to all interested in the science of entomology in Canada. Through the courtesy of Dr. C. Gordon Hewitt, Dominion Entomologist, I was permitted to suspend my operations at Agassiz for a period of three weeks to attend this meeting at Guelph, and to transact other business of a personal as well as official character.

As we are out here an integral unit in the entomological work of the Dominion of Canada, and a branch of the parent Society in Ontario, apart from the interest this Jubilee meeting will arouse in our members, I believe it well to record in our annals the origin, formation, and growth of this Ontario Society, which, as I will show in a few moments, was and is the Entomological Society of Canada. I do not believe I could do better than to quote word for word the synopsis that was printed as an introduction to the programme arranged for the occasion:—

"The first meeting of entomologists in Canada was held in September, 1862. It was then decided to form an entomological society, whose chief objects were the formation of a collection of Canadian insects, the interchange of duplicate material, and the holding of meetings with the object of advancing the science. Accordingly, in April, 1863, the Entomological Society of Canada was organized, the original membership being twenty-five. The publication of a series of valuable papers was begun, and it is a matter of great gratification to know that we shall have with us at our Jubilee meeting the contributors of the first two papers, and two of the founders of the Society, Dr. Bethune and Dr. Wm. Saunders, C.M.G. The activity

of the Society and the zeal of its members were evinced by the publication by the Society of the first number of the *Canadian Entomologist* in August, 1868, and since that time the Society's journal has regularly appeared each month. In 1870 the Society received a grant from the Council of the Agricultural and Arts Association of Ontario for the formation of a collection and the publication of an annual report on injurious insects. Accordingly, the 'First Annual Report of the Noxious Insects of the Province of Ontario' was prepared in 1870, and published by the Ontario Government in the year following. In 1871 the Government of the Province of Ontario passed a Statute incorporating The Entomological Society of Canada as The Entomological Society of Ontario, which was instituted 'for the investigation of the character and habits of insects, the improvement of entomological science, and more especially its practical bearing on the agricultural and horticultural interests of the Province.' A grant was made to the Society by the Provincial Government, and the same has been continued annually, as also has the publication of the Society's Annual Report. The national character of the Society, notwithstanding its Provincial designation, was continued, and branches were formed outside Ontario, at Montreal, Quebec, and in British Columbia. Its history has been one of steady progress, and the systematic side of the science has not been divorced from the economic, as the pages of the Society's journal, the *Canadian Entomologist*, abundantly testify. The continued progress of the Society has been largely due to the untiring efforts, fired by an enthusiasm and devotion which ever increased, of our Jubilee President, who from its foundation has, as secretary, president, editor of the journal, and permanent counsellor, devoted himself wholeheartedly to its welfare and to the advancement of Canadian entomology."

Dr. C. J. S. Bethune had been elected previously as Jubilee President in honour of his energy and zeal for the cause of entomology in the Dominion. He was unable, however, to act in his official capacity on account of defective eyesight. The Vice-President, Dr. C. Gordon Hewitt, Dominion Entomologist, ably filled Dr. Bethune's position, seated on Dr. Bethune's left hand throughout the meetings. Mr. A. W. Baker acted as Secretary, and he also performed his arduous duties with pleasure to all.

As a further detailed description of the early days of the Society, I beg leave to extract the text of Dr. Bethune's address from the pages of the *Canadian Entomologist* of November, 1913:—

"The President, Dr. Bethune, stated that, owing to defective eyesight, he was unable to prepare a formal written address, and would therefore endeavour to give some account of the origin of the Society and the proceedings that led to its formation.

"When a student at Trinity College, Toronto, he began the collection and study of insects. At that time there were no available books on the subject. The first work that gave him any assistance in naming specimens was Gosse's 'Canadian Naturalist,' a delightful work giving an account of observations made in various departments of natural history during each month of the year in the eastern townships of the Province of Quebec. In the Canadian journal there were published excellent short descriptions of the more conspicuous beetles found in the neighbourhood of Toronto by Wm. Couper, a printer by trade. These were supplemented by lists furnished by Professor Croft, of the University of Toronto. Kirby and Spence's 'Entomology' and Westwood's 'Modern Classification of Insects' were published about that time and afforded the first scientific aids to the knowledge of insects. Through the kindness of Professor Croft, the speaker had access to the library of the University of Toronto, which contained several rare works on entomology. He was also permitted to consult the books in the library of Parliament, which at that time was located in Toronto. In these libraries he spent much of his leisure-time in laboriously transcribing descriptions of Canadian insects, which, for the most part, had to be translated from Latin and French, and also in making copies of illustrations. These difficulties can hardly be realized by

students at the present day who have such an abundance of literature upon every department of natural history. Such works as Comstock's 'Manual for the Study of Insects' and Mrs. Comstock's 'How to Know the Butterflies' would at that time have been treasures indeed. However, there is no doubt that the difficulties encountered helped one to build upon a sound foundation and to acquire a more complete knowledge than could be attained by attempting to hastily read a superabundance of publications.

"At the suggestion of Professor Croft, the speaker made the acquaintance of Mr. Wm. Saunders, of London, who carried on at the time the business of chemist and druggist on a moderate scale. The acquaintance thus formed soon ripened into a mutual friendship and esteem which has continued unbroken to the present time.

"In the *Canadian Naturalist* for June, 1862, there appeared a list of persons residing in Canada, all interested in the collection and study of insects, which contained no less than thirty-six names. This was prepared by the speaker, with the assistance of Mr. Saunders. It was then proposed that a meeting should be held for the purpose of bringing together as many as possible of those interested, and to form some kind of club or society which would be of general benefit to those concerned. The result of this publication was the holding of a meeting in Toronto at the residence of Professor Croft in September, 1862. As there were only ten persons present, it was thought inadvisable to form a society at that time, but a draft of a constitution was drawn up and it was decided to hold another meeting during the coming year. On April 16th, 1863, a meeting was held in the library of the Canadian Institute, and the formation of the Entomological Society of Canada was then decided upon and its constitution drawn up and adopted. The attendance was small, but several who were unable to be present had given in their adhesion to the movement. Dr. Henry Croft, Professor of Chemistry in the University of Toronto, was elected President; Mr. Saunders, of London, Secretary-Treasurer; and the Rev. Jas. Hibbert, Curator. The others present were: The Rev. Wm. Hincks, Professor of Botany and Zoology at the University of Toronto; Dr. Sangster, Principal of the Normal School, Toronto; Dr. Beverley R. Morris, an Englishman who not long after returned to England and there became editor of a popular magazine on natural history; Dr. Cowdry and his son, Mr. N. H. Cowdry, of York Mills; and Messrs. Saunders and Bethune. The following gentlemen were unable to be present, but became original members of the Society: Mr. E. Baynes Reed, Barrister, London; Mr. E. Billings, editor of the *Canadian Naturalist and Geologist*, for many years attached to the Geological Survey; Mr. R. V. Rogers, Barrister, Kingston; Mr. T. Reynolds, Engineer of the Great Western Railway, now part of the Grand Trunk system, Hamilton; Mr. B. Billings, Prescott, who subsequently lived in the neighbourhood of Ottawa and formed a large collection of Coleoptera; Rev. V. Clementi, Peterborough, an English Church clergyman, who was greatly interested in the various aspects of natural history. Mr. Wm. Saunders was appointed by the Dominion Government in 1886 to establish and superintend a series of experimental farms extending from Nova Scotia to British Columbia. For twenty-five years Dr. Saunders conducted this work in a most able and successful manner, and his name is well known not only throughout Canada, but also in the United States and Great Britain.

"The Society thus formed began its career of active usefulness and it has steadily grown and prospered to the present time. In 1868 the publication of the *Canadian Entomologist* was begun, the first number consisting of only eight pages. It is now in its forty-fifth year of publication and is sent to all parts of the world. In 1870 the first Annual Report of the Society on 'Noxious, Beneficial, and other Insects' was published, the three contributors being Dr. Saunders, Mr. Baynes Reed, and the speaker. What really made the fortunes of the Society was the invasion of Ontario by the Colorado potato-beetle. The Board of Agriculture for the Province

requested the Society to report on the insect and to advise as to the best methods of checking or controlling its ravages. An admirable report was prepared by Messrs. Saunders and Reed; the former, being a practical chemist, was able to experiment with various poisons and to discover that Paris green was the most convenient and reliable substance for the destruction of the beetle. The result of this report was a grant from the Department of $400 per annum, which was afterwards increased to $1,000, and the incorporation of the Society under the name of the 'Entomological Society of Ontario.' For a few years the Canadian Institute in Toronto gave the Society the privilege of using its library and museum for its meetings and collections. After a few years, however, the headquarters were removed to London and continued there until 1906, when a change was made to the Ontario Agricultural College, Guelph.

"The speaker expressed the great pleasure which it gave him and his colleagues to find that so many friends had come from long distances to join in the celebration of the Jubilee meeting of the Society. He joined in giving them all the most hearty welcome and expressed his hope that they would fully enjoy their visit."

As indicated by Dr. Bethune, the meetings were well attended and well represented by delegates from Scotland, England, United States, and from the various Provinces of Canada. In all, between forty and fifty individuals were in more or less regular attendance throughout the session. Addresses of congratulation to the Society and to its Jubilee President were tendered by representatives from the University of Toronto, University of McGill, University of Manchester, Royal Society of Canada, Academy of National Sciences of Philadelphia, the Canadian Department of Agriculture, University of Edinburgh, Imperial Bureau of Entomology, Harvard University, Boston Society of Natural History, Cornell University, the Entomological Society of London, the Entomological Society of America, the American Association of Economic Entomologists, the New York Entomological Society, the Entomological Society of Washington, the United States Bureau of Entomology, the United States Department of Agriculture, the Ottawa Field Naturalists' Club, the Quebec Society for the Protection of Plants, the Montreal Branch of the Ontario Entomological Society, the Toronto Branch of the Ontario Entomological Society, and the British Museum, London, England; and on behalf of this Society I conveyed the good wishes and congratulations that I was sure was felt by all the members.

An excellent programme had been arranged by the Executive, and contributors delivered their papers for two days of the meeting. The last day was spent by the members and visitors in a trip through the famous Niagara Fruit District.

A large number of letters of recognition and congratulation were read from various European centres of learning, by cable from Russia, from Germany, from England, and from Scotland. A number of letters were also read from various entomologists stationed throughout the United States at the various experiment stations. It was very evident, throughout the whole, that entomologists throughout America and Europe and probably throughout the world had been taught to recognize the Canadian Entomological Society as an active and sound adviser in the entomological world. The meetings closed with every good feeling and regard on Friday, August 29th.

Before closing, I would like to draw the attention of the members to the fact that there exists on the Pacific Slope an Association of Economic Entomologists. The fourth annual meeting of this Society was held on April 10th to 12th, 1913, at the University of California, Berkeley, California. The meeting was held, as it appears they usually are held, in affiliation with the Pacific Association of Scientific Societies. This present yearly meeting is to be held, I fancy, at Seattle. The various societies, of which the Entomological Society is one, enrol their officers and members from all of the immediate Pacific Coast States, from Mexico to Washington, including also the Canadian Province of British Columbia, and the United States Islands of Hawaii. Several of the bordering interior but western States are included within the scope of the Society. I fancy the place and date of the meeting

for the succeeding year is arranged by joint committees uniting all the various societies combined. Prof. W. B. Herms is Secretary-Treasurer of the Entomological Society, and he resides at the University of California, Berkeley, Cal. Should any of our members wish to become members of this Society, I am sure that Professor Herms would be willing to give you assistance and notification regarding the by-laws. It might be quite advisable if a small representation of our members went to Seattle in the spring to attend the meetings, to show our appreciation of the fact that the Pacific Association of Scientific Societies are bringing the results of their labours near to our doors. California is too far for most of us to go every year, but if a good turn-out of North-western entomologists were present at this spring meeting it may impress the authorities of the advisability of invading our territory once every so often.

A REVIEW OF APPLIED ENTOMOLOGY IN BRITISH COLUMBIA.

BY R. C. TREHERNE, EXPERIMENTAL FARM, AGASSIZ.

In an attempt to supplement the paper that our President, Mr. Day, has just presented, representing as it does a review of the systematic side of the science in the Province, I will refer, in as few words as possible, to the history and progress of the economic considerations that have taken place within our boundaries.

As will be noticed through this paper, applied entomology in this Province originated and has its place in the published annals of the British Columbia Fruit-growers' Association. Sundry notes and observations by those interested in fruit-growing in the early days brought forth remarks concerning insects. Consequently we find that the phase of entomology, dealing with insect pests of the agriculturist, and referred to as "economic entomology," began almost conjointly with the formation and foundation of the British Columbia Fruit-growers' Association. This Association began its active career in the year 1889.

In 1897 we find "An Act respecting the Provincial Board of Horticulture," cited as the "Horticultural Board Act" (1894, c. 20, s. 1), in operation. This enactment was the result of two previous Acts regarding the Board of Horticulture, the first coming into operation about 1892. In the wording of the Act, it states that "the Lieutenant-Governor in Council shall appoint . . . a competent person especially qualified by practical experience in horticulture, who shall be known as 'Inspector of Fruit Pests.'" *

Mr. Ernest Hutcherson, of Ladner, was first appointed as Inspector of Fruit Pests in about the year 1892 under the authority of the original Board Act. Two years later he was succeeded by Mr. R. M. Palmer, who occupied this position in the neighbourhood of eight years, finally handing the office over to Mr. Thomas Cunningham in 1902, who to-day (1914) is still operating the Act in a most efficient manner. Mr. Cunningham, previous to his appointment, had charge of the fruit-inspection work since 1896.

The "Horticultural Board Act," however, after various changes, insertions, and amendments, finally, in 1911, was combined in the "Act respecting Agricultural Associations," and cited as the "Agricultural Associations Act," Part IV., the former Act and title being repealed.

As I have already said, we look to the Horticultural Board and to the Fruit-growers' Association for our information relative to the economic pests of fruit and agriculture of the time.

Two men compiled and published notes and remedies on insect pests of the agriculturist in the Province from the records of the British Columbia Fruit-growers' Association. Mr. J. R. Anderson, formerly Deputy Minister of Agriculture, and Mr. R. M. Palmer, formerly Inspector of Fruit Pests and later succeeding Mr. Anderson as Deputy Minister of Agriculture for the Province, are responsible for the dissemination of practical knowledge on economic entomology in these early

* Hort., chap. 94, sec. 9.

times. The various members of the Executive of the Horticultural Association, through their interest in the fruit-growing problems of the Province, have added much to our entomological knowledge.

As a result of their labours, in 1895 the Horticultural Society and Fruit-growers' Association of British Columbia published a "Pest and Remedy Supplement" as adopted by a committee appointed at an annual meeting of the Society. This committee consisted of Messrs, G. W. Henry, Hatzic; Thos. Cunningham, New Westminster; Michael Baker, Victoria; R. M. Palmer, Victoria; G. Hadwen, Duncan; E. Hutcherson, Ladner; and T. A. Sharpe, Agassiz; and it was under the direction of these gentlemen that the "Supplement" was issued.

The first officers of the Horticultural Society were J. M. Browning, Thos. Cunningham, G. W. Henry, and A. H. B. McGowan. In the six succeeding years a number of officers were appointed to the Executive of the Society, among them being W. J. Harris, Tom Wilson, John Kirkland, Wm. Knight, T. G. Earle, and J. R. Anderson.

In 1899 and 1901 two reports by Mr. R. M. Palmer, Inspector of Fruit Pests, were issued, containing remedies and suggestions recommended for adoption by farmers, fruit-growers, and gardeners of the Province, prepared for the Provincial Board of Horticulture.

In 1907, and reissued again in 1908, Mr. Thomas Cunningham, as Inspector of Fruit Pests, published a "Spraying Bulletin" on "Orchard Cleansing."

In 1908 Mr. J. R. Anderson, at the time Deputy Minister of Agriculture, published Bulletin No. 24 from the Department of Agriculture of British Columbia, and he titled his bulletin "Farmers' Foes and their Remedies." In presenting this bulletin to the agriculturists of the Province, Mr. Anderson states in the introduction: "The purpose of the present bulletin is to afford a description in a succinct form of those pests which are prevalent, reported, or are likely to be introduced in the Province, and their natural enemies, with the remedies prescribed by competent authorities or which have been found by experience to be the most effective." This bulletin represents careful and painstaking construction and to-day is the most useful issue we have relative to insect pests of the Province.

Touching the subject of artificial control measures and spraying, some interesting records can be gleaned from private journals and diaries. Few published records appear to be available on the number of machines and to what extent spraying for insect pests was practised by the fruit-growers. Consequently, while the following records appear to stand, it is just possible that omissions have occurred to some extent.

In 1885 Mr. Thomas Cunningham bought a 45-gallon spray-pump from the Field Spray Pump Company of New York. Mr. William Clarkson, of New Westminster, also sprayed for aphis and apple-scab with a similar hand-pump of his own purchase in the 80's. In 1888 Mr. W. J. Brandrith, of Ladner, owned a "stirrup" spray-pump. This was of cast iron with a wrought-iron plunger, and was only capable of throwing a spray some 12 feet or so. Mr. Brandrith in 1890 again arranged for the purchase and sale of six 5-gallon bucket Spramotor hand-pumps to various fruit-growers in the Lower Fraser Valley. These pumps cost, laid down, $30 each. In 1892 he again bought a No. 2 40-gallon Spramotor for his own use.

Bordeaux was in use between the years 1885 and 1890 at the 4-4-50 formula and whale-oil soap, which latter was imported from the Standard Soap Company of San Francisco, Cal., at the time.

In the early 90's Mr. T. A. Sharpe, Superintendent of the Dominion Experimental Farm, Agassiz, had a Spramotor hand-pump sent out from London, Ontario, for use on the Government Farm. As far as can be gathered, at least six more spray-pumps from the same firm came into the Fraser Valley and on to Vancouver Island about the same time. Mr. Tom Wilson, on his farm near Harrison, in the Fraser Valley, bought a Myers spray-pump in 1892 and fitted it to a barrel. He

says: "The only thing we used to spray for was the green aphis, and we used tobacco-stems steeped in water. Previous to that we used a solution of concentrated lye or caustic soda applied with a swab or whitewash-brush to the bodies and larger limbs of the trees. About 1893 woolly aphis used sometimes to be noticed, and it was the practice to apply a little raw coal-oil to the affected parts with a swab. Oyster-shell scale, when treated at all, used to get a lick of lie and water. I remember seeing this scale in the woods in the early 90's."

Records for the Okanagan District are limited. In 1895 one hand-power Bean sprayer was in use on the Coldstream Ranch, Vernon. With the exception of a brass Spramotor No. 2, owned and bought by Mr. Price Ellison, M.L.A., later and at the present time Minister of Agriculture for the Province, it is doubtful whether any other existed in the Upper Country previous to this time, although conjointly in the Lower Mainland spraying fruit-trees for fungi and insects was more or less general. Spraying, however, for insect pests did not become general all over the Province in the fruit-growing areas until about 1900.

As a precautionary measure to the rapidly increasing fruit-growing industry, and to safeguard this industry from the introduction of more insects than those indigenous to the Province, a station was built in Vancouver in 1895, to be used for the inspection of all fruit-trees and vegetation that were passing into the Province from points outside. In 1896 the fumigation of incoming nursery stock, combining tree to tree-inspection with fumigation, was begun by the Provincial authorities. Mr. Thomas Cunningham had charge of this work as a member of the Board of Horticulture. To Mr. Cunningham is due the credit for the erection and manipulation of this detention-shed for incoming vegetation, and to his opinion on the Executive of the Board we are indebted for the foundation of the present efficient system of pest-control.

In 1900 the Dominion Government, directed by Dr. James Fletcher, Dominion Entomologist and Botanist, operated a separate fumigation-station in Vancouver under the "San Jose Scale Act." Mr. Tom Wilson had charge of this work. It was not until several years later that a co-ordination of the Dominion and Provincial work in fumigation and inspection took place.

Occasionally we find records that certain very dangerous insects were evading the system of fumigation and inspection. In 1896 an infestation of what, at first, was thought to be the dreaded San Jose scale was noticed at Popcum, east of Chilliwack. It afterwards proved to be the Putnams scale. In 1902 or 1903 some San Jose scale were discovered on trees which had passed through the detention-sheds. In 1904 an outbreak of codling-moth occurred at Kamloops. Spraying the trees, of which there were, roughly, 3,000 growing in and around Kamloops at the time, was undertaken by the Government, but a certain lack of co-operation on the part of the orchard-owners hindered the work of control, so that the outbreak continued until about 1910, when the infestation was believed to be safely overcome. For the past four years no further evidence of the reappearance of the moth or its larva has been received from the district, which indicates the control-work has been successful.

In the same year (1904), again, another and more serious outbreak of codling-moth took place in the southern portion of Vancouver Island. Deputies of the Department of Horticulture were instructed to locate and destroy all infected fruit and larvæ, and endeavour to induce the growers to co-operate in the matter of control. In 1909 the fight still continued against the moth, as many as 17,582 trees being found infected, and 7,610 fruits from which larvæ were taken. Urgent measures on the part of the growers and the Government were then undertaken, with the result that a few years later the moth infestation was reduced to a very low condition.

The introduction, localization, and spread of these dangerous pests had the double effect of increasing the rigidity of the inspection and fumigation regulations and of stimulating the cause of artificial control measures in the field, for to-day we

find the system of inspection and fumigation is very complete and efficient, the possibility of the introduction of any dangerous insect pests being reduced to a minimum, and spraying in the orchard has become general throughout the Province. Mr. Cunningham, assisted by Mr. W. H. Lyne, Assistant Inspector of Fruit Pests, in close co-operation with the Dominion Division of Entomology, represented up till October, 1911, by Mr. Tom Wilson, acting under the Dominion "Destructive Insect and Pest Act," operate the co-ordinated inspection and fumigation work in Vancouver, whereby every plant product is duly given individual inspection and fumigation within certain regulations. The writer took over the work from Mr. Wilson in the fall of 1911.

The first power-spraying outfit (Bean) was brought to the Province in 1910. To-day there are nine large machines at work in the various sections of the Province operated directly by the representatives of the Provincial Government. Several private individuals and fruit-growing concerns also enlist the aid of these machines to reduce the margin of loss in their orchards. At present between Armstrong and Penticton there are about twenty-five private machines in operation. It is curious that the Lower Fraser Valley, which was the original fruit-growing area of the Province before the Okanagan became famous, forming as it did the advance guard in the use of the spraying-machine, and first illustrating the principles of pest-control in the early days of the Province, has let other sections go ahead and leave them in a not very much better position than the early 90's. From the experience of the writer during the past few years, it would seem apparent that there are no more than fifteen individuals in the valley who own and operate their own spray-machines, hand and power, for the control of orchard pests and diseases.

In May 1912 Dr. C. Gordon Hewitt, Dominion Entomologist, established a field station for investigational research in entomology, the object being to study the life-history and habits of insects in the Province, preferably those of economic importance and their control. The writer has the honour, at the moment, of occupying the position as field officer for British Columbia under the direction of the Dominion Entomologist. Through the courtesy of Mr. Arthur Brealey, fruit-grower, Hatzic, in the Lower Fraser Valley, the Dominion Division of Entomology was permitted to establish temporary field-quarters on his farm for the purpose of investigating the life-history and habits of *Otiorhynchus ovatus*, the strawberry-root weevil, an insect which was causing very considerable annoyance to the growers in the locality. These temporary quarters at Hatzic were removed to permanent ones on the Dominion Experimental Farm, Agassiz, also in the Lower Fraser Valley, in the spring of the next year, 1913.

In the spring of 1912, again, the Provincial Department of Agriculture appointed Mr. W. H. Brittain, at the request of the British Columbia Board of Horticulture, to the position of Entomologist and Plant Pathologist for the Province. Mr. Brittain commenced to work collecting data on fungous diseases and insects of the Province in April, 1912. His headquarters were at Vernon. In the fall of 1913 he accepted a position in charge of the Biological Department at the Truro Agricultural College, Nova Scotia, thus leaving British Columbia at this time. The results of his investigations in insects in the Province are for the most part recorded in our proceedings.

Under the date of November 12th, 1912, Seymour Hadwen, D.V.Sci., First Assistant Pathologist, Dominion Veterinary Department, at the branch office on the Experimental Farm, Agassiz, published an account on the "Economic Aspect and Contributions on the Biology of Warble-flies" under the auspices of the Dominion Department of Agriculture, Health of Animals Branch.

The records of entomological work accomplished within the Province since 1911, and the workers who are responsible for the dissemination of knowledge at this time, will be found in the publications of the proceedings of the Society. As the science stands to-day, everything bids fair for the future. The numbers of workers are increasing and the demand for knowledge is being felt. The moment should not pass without one last reference to the splendid foresight shown by the several names

mentioned in this paper in safeguarding the agricultural interests of the Province by their sound judgments and sane measures, embodied in the regulations of the Board of Horticulture, against the introduction of dangerous insect pests—pests which are causing considerable annoyance and expense to fruit-growers and farmers in other portions of the Dominion of Canada, and which might with ease be introduced through the medium of trade into this Province, which in the early 90's was only just beginning to develop its wonderful agricultural and horticultural resources. To-day this Province stands, in comparison to its fruit-growing areas, the cleanest of any fruit-growing country in the world. There is little codling-moth, no San Jose scale, no very serious insect pest in the orchard or on the farm, and we look back to the few men, whose names have been incorporated in this paper, through whose wise judgment and who through the exercise of proper precaution made this condition possible.

If it had not been for the Horticultural Regulations, for it has been on the basis of these regulations that our economic entomology has been built so far, and about which mention has been made, our history of British Columbian entomology up to the present would have been very different. Instead of applying quarantine and preventive measures as have been done and as we are in the main doing now, we should have been studying and controlling insect pests of the farmer, of more serious intent than any we have with us under present conditions. As such the published record of entomology in British Columbia would have been much different.

No praise, therefore, is too great for those whose energies have placed this Province on an independent pedestal in the field of economic or applied entomology, causing her to stand an example to all of the practical and elementary principles of entomology, which other Provinces and States failed to follow until too late.

Our work for the future will be to retain this standard of immunity at all costs of labour and expense, and we will endeavour at the same time to supplement our knowledge on those insects of economic importance in our midst and indigenous to the Province. There are few countries with such an interesting entomological fauna. There are few studies that offer such scope for individual research as a study of this same entomological fauna; consequently the field lies open, in systematic or economic investigation, in popular or scientific research, for those that may wish to place their energies and the products of their brains towards a furtherance of our knowledge on British Columbia insects, their lives and their characteristics.

MITES: THEIR CLASSIFICATION AND HABITS, WITH SOME OBSERVATIONS ON THEIR OCCURRENCE IN THE OKANAGAN.

BY J. SYDNEY DASH, B.S.A.

The work of mites has been brought so much before us in this Province throughout the past season (we need only mention here the discovery by Güssow of a species of *Eriophyes* associated with a kind of "silver-leaf," and also by Brittain of a species of the same genus causing apple-blotch on the fruit) that the writer, when asked to make a few remarks at this meeting, thought it would not be out of place to treat briefly on this class of minute animals, so that a more exact idea of the nature, classification, and importance of the class may be obtained.

The animal kingdom, as you are probably aware, is divided into a number of branches or phyla, each phylum having its own peculiar characteristics. The phylum with which we have to deal is the *Arthropoda*, a group of animals having jointed bodies and jointed legs. In this phylum are the following classes:—

1. *Crustacea.*—These are water-breathing animals. They possess many legs and hard outer or exoskeletons; head and thorax are united. Example: Crabs, lobsters, crayfish.

2. *Arachnida.*—These are land forms, possessing eight legs, head and thorax united. Example: Scorpions, spiders, mites, and ticks.

3. *Malacopoda.*—These are also land forms, body worm-like and possessing numerous legs. The *Peripatus*, an animal rarely met with, is an example of this class.

4. *Diplopoda*—Also land animals. They possess long, cylindrical, and many-segmented bodies. Two pairs of short legs are found on each segment; short antennæ are also present. Example: Thousand-legged worms (*Spirobolus*).

5. *Chilopoda.*—Another class of land animal. The bodies are long, flat, and many-segmented. One pair of rather long legs is found on each segment; long antennæ are present. Example: Centipedes (*Scolopendra*).

6. *Insecta* or *Hexapoda.*—Either aquatic or terrestrial, but chiefly the latter. The body of the adults is divided into three distinct regions—head, thorax, and abdomen. Adult forms possess six legs and many are winged. Metamorphoses occur in all but the two lowest orders. Example: Insects (butterflies, moths, beetles, etc.).

From the above classification we gather that mites, although closely related to insects, are not placed in the same class; hence it is a mistake to call a mite an insect. The main differences, as have been noted, are that in the mites head and thorax are united and eight legs are present; while in insects the body of adults is divided into three distinct regions—head, thorax, and abdomen, and six legs are present. Some species, however, notably the blister-mites, have only four legs, while young red spiders have six legs before the first moult.

GENERAL HABITS.

The mode of life of the different members of this class varies greatly; some are parasitic on higher animals, others infest living plants, and many feed upon dead animal or vegetable matter, thus acting as scavengers. Of the mites that are parasitic on higher animals, we have only to mention the various ticks that are so common in many parts. An exception to this is the so-called sheep-tick, which is a true insect belonging to the order Diptera (flies). Man himself is subject to the attacks of a well-known parasitic mite, the itch-mite. It burrows into the skin, causing the itching sensation so characteristic of the disease. Parasitic mites sometimes occur on insects; a common species is found beneath the wings of locusts. Many mites also infest food products; they are sometimes found in cheese, in sugar, and in preserved meats.

MITES INJURIOUS TO PLANTS AND THEIR CONTROL.

As these interest us more particularly to-day, we shall now briefly consider some of their important features. They all feed by puncturing the tissues and extracting plant-juices. Eggs are laid singly on the outside or inside of plant-tissues or in clusters upon the bark. The young develop rapidly and soon new broods are produced; consequently a great deal of damage is often done. They continue to breed throughout the summer, hot, dry weather being especially favourable. Cold, wet weather checks their activities. The common mites known to us in this Province are the red spider (*Tetranychus bimaculatus*), which frequents all sorts of vegetation; the brown mite (*Bryobia pratensis*), also a general feeder; and the pear-leaf blister-mite (*Eriophyes pyri*), producing blister-like galls on pear-leaves. To these may now be added the two forms mentioned in the earlier part of this paper. In warmer countries mites are responsible for a great deal of harm. The red spider is very common, one form being especially bad on citrus trees. We may also mention the silver-mite of lemon (*E. oleivorus*) and the cotton-leaf blister-mite (*E. gossypii*). Reference will only be made in this discussion to the forms found in the Province.

It is generally believed that mites winter over in the adult stage under buds and bark-scales. At any rate, this seems true in the case of the pear-mite. According to Weldon, of Colorado, who has published a paper in the *Journal of Economic Entomology*, October, 1910, on his observations of orchard mites, the adult

red spider (*T. bimaculatus*) passes the winter at a depth of 1¼ to 2 inches in the soil. In a very interesting manner he describes the migration of this species from the tree to the soil. His observations are remarkably convincing. The brown mite (*B. pratensis*) is closely associated with *T. bimaculatus*, but in the case of the former, webs are usually absent. The injury from this mite takes place early. Weldon states that *B. pratensis* winters over in the egg stage, the winter eggs being deposited on the trees before August 1st in Colorado.

The problem of mite-control is a difficult one, but good work has been done by many stations with satisfactory results. They can usually be controlled by the summer application of flowers of sulphur alone, powdered lime and flowers of sulphur, or lime-sulphur spray. Weldon found that summer spraying with lime-sulphur was remarkably effective against red spider (*T. bimaculatus*), while for brown mite (*Bryobia pratensis*), which winters over in the egg stage, a dormant spray of lime-sulphur early in the spring gave much better results. With this dormant spray he states that the mites die a short time after hatching from the eggs.

OBSERVATIONS MADE LAST OCTOBER.

The writer last season had a great deal to do with nursery-stock inspection in different parts of the Province. In one of the nurseries curious disfigurations or incrustations of the bark were observed on Northern Spies. Freehand sections were made of the affected parts, and on examination a large number of mites of the genus *Eriophyes* were found. The matter was referred to the Dominion Entomologist for his report. He corroborated my statement that a species of *Eriophyes* was present under the incrustations, but suggested that from the way in which they were found they were probably wintering over in these rough places on the bark and not causing any harm. On the bark of the same trees, egg-blisters of the apple-leaf hopper (*Empoasca mali*) were also found, and it appears that these disfigurations and incrustations are due to the breaking of the egg-blisters when the young hoppers emerge. If mites were present on the leaves in the summer, they would easily crawl to these hiding-places in the bark on the approach of cold weather in the fall. The writer also took the matter up with Mr. Brittain, former Plant Pathologist of the Province, to find out his experience, if any, with this occurrence. He stated that several examinations of affected trees had been made by him during the summer and no trace of mites had he found. Now, however, he had no difficulty in isolating them from the trees sent him, and expressed the belief that they were of the same species as the one associated with "silver-leaf," to which reference has already been made. The problem is an interesting one, for if the mite in question is responsible for some of the silver-leaf appearance in nurseries and it winters over in the places referred to, the life-history will be complete, and a means of control, by spraying with lime-sulphur when the leaves are appearing, suggests itself. Observations of the summer habits of the mite on the leaves have been made by Mr. Brittain, and a further batch of trees with bark incrustations have been sent him, so that he may study and compare the characters of both more thoroughly and be able to state definitely whether or not the mite found under the incrustations is the same species as that working on the leaves during the summer. It may be of interest to note that the disfigurations on Northern Spy, I am informed, are of common occurrence all over the Province.

It is my regret that I shall not be in the Province next summer to investigate this problem more thoroughly, as no doubt some more light on the subject is greatly needed. It is to be hoped, however, that it will be taken up by some student in entomology.

RESOLUTIONS.

Moved by Mr. Taylor, Kelowna, "That this Society, owing to representation having been made at their annual meeting in January, 1914, by fruit-growers from the Okanagan District, in relation to the possibility of the 'carrying-over' of fire-blight (*Bacillus amylovorus*) by bees in their hives during winter, and thus spreading

the disease in the spring to orchard trees, respectfully request the Government to instruct an investigation into the matter to confirm or refute the suppositions of the growers."

Seconded by Mr. Hugh, Victoria. Carried.

Moved by Mr. Lyne, Vancouver, "That this Society respectfully urge the Provincial Government to appoint, as soon as possible, a capable Entomologist, to pursue the labours relating to entomology in the Province of British Columbia so ably begun by Mr. W. H. Brittain, in his capacity as Provincial Entomologist and Plant Pathologist. And, further, that in the opinion of this Society it is advisable that these two positions of Entomologist and Plant Pathologist be separated, a separate official being delegated to each Department."

Seconded by Mr. Taylor, Kelowna. Carried.

Moved by Mr. Day, Duncan, "That the cordial thanks of this Society be sent to the Honourable Price Ellison, Minister of Agriculture for the Province of British Columbia, for the valuable and opportune assistance given to the Society by obtaining a grant of money and by authorizing the printing of reports; and at the same time to express the Society's appreciation of his personal interest in the objects of the Society."

Seconded by Mr. Treherne, Agassiz. Carried.

Moved by Mr. Robinson, Victoria, "Whereas from official reports of recent date 'foul-brood' among bees has made its initial entry into the Province of British Columbia; and whereas the Province has in the past, and is at the present date, practically free from this bee-disease, through the timely destruction of all infected colonies known to exist in the Province; and whereas in the interests of the bee-keeping industry it is of the utmost importance that this clean bill of health be most carefully maintained as a Provincial asset: It is hereby *Resolved*, That this the Entomological Society of British Columbia, in annual convention assembled, do petition the Honourable the Minister of Agriculture to so amend the 'Foul Brood Bees Act' that live bees and bee fixtures that have been used (queen bees and their escorts excepted) be barred absolutely from entry into the Province under any pretext whatsoever, as the section of the present Act pertaining to the quarantining of bees for ninety days is open to question as a satisfactory safeguard to the Province, for the following reasons: First, bees cannot be confined to their hives for ninety days without suffering death from worry or starvation. Second, from the nature of the bees flying from one to four miles from their home, thereby visiting the bees in British Columbia, and British Columbia bees, in their turn, visiting the hives of the bees held in quarantine at the boundary-line, and by so doing, as the exchange of honey, which may contain the germs of the disease, takes place, 'foul-brood' may be spread around."

Seconded by Mr. Cunningham, Vancouver. Carried.

Moved by Mr. Treherne, Agassiz, "That this Society respectfully and earnestly request the Provincial Government to grant the Society the annual sum of $250 and to make provision for the publications of their reports."

Seconded by Mr. Blackmore, Victoria. Carried.

"That whereas it has come to the knowledge of this Society, the Entomological Society of British Columbia, that certain collections of insects, composed of insects gathered for the most part from British Columbia in the past, have been sold out of the Province to foreigners, or presented to collectors in other parts of the Dominion of Canada; and whereas, in the opinion of this Society, it is of the utmost importance that representative collection of British Columbia insects be obtained and built up for the benefit of British Columbia collectors and for the students of the University of British Columbia: Be it therefore *Resolved*, That this Society respectfully urge all its members to notify the Executive of the Society when collections of insects relating to the Province come on to the market for sale. And, further, owing to the financial state of the Society at the present time, that the Provincial Government be notified as to the above, and be respectfully requested

to assist in procuring the above insects should they be in good order and representative of the Province."

Recommended and passed by the Advisory Board.

ELECTION OF OFFICERS.

The following officers were elected for the year 1914:—

Honorary President—E. Baynes Reed, Meteorological Office, Victoria.
President—G. O. Day, F.E.S., Duncan.
First Vice-President—Lionel E. Taylor, F.Z.S., M.B.O.U., Kelowna.
Second Vice-President—E. H. Blackmore, Victoria.
Secretary-Treasurer—R. C. Treherne, B.S.A., Agassiz.
Assistant Secretary—(Not appointed.)
Advisory Board—G. O. Day, L. E. Taylor, E. H. Blackmore, R. C. Treherne, Tom Wilson, W. H. Lyne, A. H. Bush.

NOTICE.

To become a member of this Society "the annual fee is $1, on payment of which, and on approval of three-fourths of the members present at the regular annual meeting, the individual becomes a duly accredited member." Prospective members are advised to send in their names to the Secretary at any time they wish during the year, accompanied by $1, for which they will receive all back reports of the Society as are available for distribution up to that time, and their names will be brought forward at the regular annual meetings in January of each year.

Members will receive the monthly issues of the *Canadian Entomologist*, the annual reports of the Ontario Entomological Society, various publications of the Dominion Division of Entomology, and the reports of the British Columbia Entomological Society, as well as receive assistance by all and every member in the identification or control of insects.

ERRATA.

(At the request of the Secretary, the following corrections in Bulletin No. 3, N.S., in the Proceedings of the British Columbia Entomological Society, were noted by Mr. Arthur Gibson, Chief Assistant Entomologist, Dominion Division of Entomology, January, 1914.)

On page 37—*Paragrotis ochrogaster* is now *Euxoa ochrogaster*. Zebra caterpillar (*Mamestra canadensis*). This should be *Mamestra picta*. *M. canadensis* is not an economic species; in fact, it is a rare moth. We have no record of it occurring in British Columbia. It was described from New Brunswick. *Nephelades* should be *Nepheloides minians*. *Noctua clandectina* should be *N. clandestina*. *Carneades scandiens* should be *Euxoa scandiens*. *Posograti velusta* should be *Porosagrotis vetusta*. *Feltia subgothica*, the dingy cutworm, should be now referred to as *Feltia ducens*.

Page 42, line 34—*D. obesics* should be *D. obesus*.

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PAPERS FOR FUTURE PUBLICATION.

The following papers presented at the meeting have been withdrawn for publication at some later date:—

1. Studies in Coleoptera—A. W. Hanham, Duncan.
2. Insects of the Year—Tom Wilson.

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